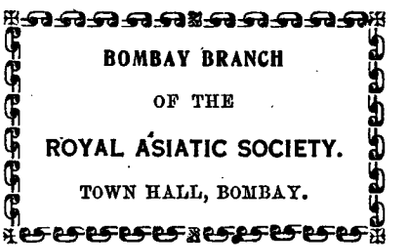
Report of the
Sanitary Measures in
India
1893-94

00134527



Digitized with financial assistance from

Government of Maharashtra

on 01 February, 2020

REPORT

ON

SANITARY MEASURES IN INDIA

IN

1893-94.

134527

VOL. XXVII.

Presented to both Houses of Parliament by Command of Her Majesty.

00134527

LONDON:
PRINTED FOR HER MAJESTY'S STATIONERY OFFICE,
BY EYRE AND SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.

And to be purchased, either directly or through any Bookseller, from
EYRE AND SPOTTISWOODE, EAST HARDING STREET, FLEET STREET, E.C., and
32, ABINGDON STREET, WESTMINSTER, S.W.; or
JOHN MENZIES & Co., 12, HANOVER STREET, EDINBURGH, and
90, WEST NILE STREET, GLASGOW; or
HODGES, FIGGIS, & Co., LIMITED, 104, GRAFTON STREET, DUBLIN.

1895.

[C.—7846.] *Price* 1*s.* 10*d.*

CONTENTS.

REPORT.

	Page
I. European Army:	
Sickness and mortality in 1893	1
Cholera	2
Small-pox	2
Fevers	2
Bowel complaints	3
Venereal diseases	3
Invaliding	3
II. Native Army:	
Sickness and mortality in 1893	4
Bengal	4
Corps of Central India and Rajputana	4
Hyderabad Contingent	5
Madras	5
Bombay	5
III. General Population:	
Vital Statistics	6
Bengal	6
North-Western Provinces and Oudh	8
Punjab	9
Burma	11
Central Provinces	12
Assam	12
Madras	13
Bombay	14
Berar	15
IV. Jails:	
Sickness and mortality in 1893	17
Bengal	17
North-Western Provinces and Oudh	18
Punjab	18
Burma	19
Assam	19
Central Provinces	19
Madras	20
Bombay	20
Berar	20
V. Vaccination:	
General results	22
Bengal	22
North-Western Provinces and Oudh	23
Punjab	23
Burma	23
Central Provinces	24
Assam	24
Madras	25
Bombay	25
Berar	25
VI. Medical Institutions:	
Civil Hospitals and Dispensaries:	
Bengal	26
North-Western Provinces and Oudh	27
Punjab	28
Burma	28
Central Provinces	28
Assam	29
Madras	29
Bombay	29
Berar	30
Lunatic Asylums:	
Bengal	30
North-Western Provinces	31
Punjab	31
Burma	31
Central Provinces	31
Assam	32
Madras	32
Bombay	32
Medical Schools:	
Bengal	32
North-Western Provinces and Oudh	33
Punjab	33
Madras	34
Bombay	34
VII. Sanitation:	
Civil:	
Bengal	35
North-Western Provinces and Oudh	36
Punjab	36
Burma	36
Central Provinces	37
Assam	37
Madras	37
Bombay	38
Berar	39

ABSTRACTS.

	Page
India Sanitary Report for 1893:	
European troops	43
Native troops	55
Jails	63
General population	66
History of chief diseases	74
Vaccination	90
Sanitary works	93
General remarks	99
Note on the influence of railways in the dissemination of cholera	104
Madras Sanitary Report for 1893:	
General population	107
Chief diseases	110
Sanitary works	117
General remarks and Personal proceedings	127
Sanitary Engineering Department	128
Bombay Sanitary Report for 1893:	
General population	129
Chief diseases	131
Sanitary works	133
General remarks	133
Shipping and Health of the Port of Bombay	135
Calcutta Municipal Report for 1893–94	142
Calcutta Health Report for 1893	145
Madras Municipal Report for 1893–94	150
Bombay Municipal Report for 1893-94	155
Bombay Health Report for 1893	159

APPENDIX.

Memoranda by the Army Sanitary Commission on:—	
India Sanitary Report for 1893	165
Bengal Sanitary Report for 1893	171
North-Western Provinces and Oudh Sanitary Report for 1893	174
Punjab Sanitary Report for 1893	177
Burma Sanitary Report for 1893	180
Central Provinces Sanitary Report for 1893	183
Assam Sanitary Report for 1893	186
Rajputana Dispensary, Vaccination, Jail, and Sanitary Report for 1893	189
Coorg Sanitary Report for 1893	190
Madras Sanitary Report for 1893	192
Bombay Sanitary Report for 1893	195
Hyderabad Assigned Districts Sanitary Report for 1893	199
Calcutta Municipal Report for 1893–94	202
Madras Municipal Report for 1893–94	204
Bombay Municipal Report for 1893–94	205

Reports of the Work of the Sanitary Boards in the several provinces of India during the years 1890–93 — 207

A. GODLEY,
Under Secretary of State for India.

INDIA OFFICE,
6th August 1895.

REPORT.

THE present Report on Sanitary Measures in India during the year 1893 is prepared for presentation to Parliament. It contains chapters on the health of the European and Native Troops, on the health of prisoners in jails, and on the health of the general population; it also contains chapters on vaccination, on medical institutions, including medical schools and lunatic asylums, and a chapter on sanitary works. Appended to the Report are abstracts of reports by the three principal Sanitary Commissioners in India, and memoranda by the Army Sanitary Commission in England reviewing the several Sanitary Reports for India, also accounts of the work of Sanitary Boards which were constituted a few years ago.

I.—EUROPEAN ARMY.

Sickness and mortality in 1893.

The general health of the European troops on service in India during 1893 was, on the whole, much more satisfactory than in the previous year, save that there was a small increase in the daily sick rate. On an average strength of 70,091, the admissions into hospital were in the ratio of 1,415 per 1,000 against 1,517 in 1892, the daily sick-rate was 87 or 3 per 1,000 more, and the death-rate fell from 17·07 to 12·61. The loss by invaliding was 25 per 1,000, or 1 per 1,000 more than in 1892, bringing the total loss by death and invaliding up to 38 per 1,000, a decrease of 3 per 1,000 on the previous year.

The following statement shows the relative extent of sickness and mortality among European troops in the three Presidencies during 1893 and the previous year:—

Presidency.		Average Strength.	Ratio per 1,000 of Average Strength.				
			Admissions.	Daily Sick.	Deaths.	Invaliding.	Total Loss.
Bengal	1893	43,150	1,466	91	14·35	26	40
	1892	42,198	1,582	87	19·81	23	42
Madras	1893	13,419	1,230	85	9·54	26	36
	1892	13,227	1,236	83	12·32	33	45
Bombay	1893	13,522	1,434	75	10·13	22	32
	1892	12,712	1,593	74	12·90	21	34
INDIA	1893	70,091	1,415	87	12·61	25	38
	1892	68,137	1,517	84	17·07	24	41

It will be seen from the above statement that of the three armies Bengal still continued to be the most unhealthy. The chief causes of sickness in the whole European Army were, as in the previous year, venereal diseases and ague, the former yielding a ratio of 466 per 1,000 against 410 in 1892, and the latter 365 per 1,000 against 429. More than half (59 per cent.) of the total sickness resulted from these two causes. Enteric fever, as usual, was the chief cause of mortality, and the death-rate from it was 5·29 per 1,000 against 5·52 in 1892. This fever yielded 42 per cent. of the total deaths. There were only 16 admissions from cholera in the whole Army and 10 deaths in 1893.

Bengal Army.

In the Bengal Army the admission rate fell from 1,582 per 1,000 in 1892 to 1,466, the daily sick-rate rose from 87 to 91 per 1,000, and the death-rate declined from 19·81 to 14·35. Ague and venereal diseases were the chief causes of admission to hospital, contributing 32 and 28 per cent. respectively of the total sickness. The chief cause of mortality was enteric fever, with a ratio of 6·40 per 1,000, being the same as in 1892. Under this one head alone 45 per cent. of the total deaths occurred. From cholera there were only 5 deaths, equal to 0·11 per 1,000 of strength, among the Bengal troops, against 102 or 2·42 per 1,000 in 1892.

Madras Army.

Comparing the results in the Madras Army with those of the previous year, there is a decrease of 6 per 1,000 in the admission rate, an increase of 2 in the daily sick-rate, and

a decrease of 2·78 in the death-rate; the mortality of the year (9·54) was the lowest ever recorded. As in Bengal and Bombay venereal diseases and ague caused the majority of the admissions, the former yielding 39 per cent. of the total admissions and the latter 11 per cent. Among the death causes enteric fever was the chief, contributing 35 per cent. of the total deaths, against 25 per cent. in 1892. There was only one case of cholera in the Madras Army, and this proved fatal.

Bombay Army.

In the Bombay Army there was a decrease of 159 in the ratio of admissions and of 2·77 in the death-rate, but an increase of 1 in the daily sick-rate. Chief among the diseases causing admissions were ague and venereal diseases, together yielding 63 per cent. of the total. Of the deaths 36 per cent. resulted from enteric fever. From cholera there were only 4 deaths, equal to 0·29 per 1,000 of strength, against 12 or 0·94 in 1892.

Groups of stations.

The following table shows the sickness and mortality among the European troops according to groups:—

Groups.	Average Strength.	Ratio per 1,000 of Average Strength.		
		Admissions.	Daily Sick.	Deaths.
Burma Coast and Bay Islands	1,079	1,328	104	15·76
Burma, Inland	2,588	1,541	95	11·20
Bengal and Orissa	2,259	1,447	90	14·17
Gangetic Plain and Chutia-Nagpur	7,394	1,476	107	9·60
Upper Sub-Himalayan	13,751	1,542	92	15·85
Indus Valley and North-Western Rajputana	5,203	1,713	87	16·91
South-Eastern Rajputana, Central India, and Gujarat	6,257	1,562	91	12·79
Deccan	9,905	1,126	76	8·48
Western Coast	1,511	1,417	83	16·54
Southern India	3,671	1,282	91	8·17
Hill Stations	9,906	1,332	80	13·02
Hill Convalescent Depôts	2,756	1,366	90	16·69

Of the above 12 groups, all but three (Deccan, Hill Stations, and the Western Coast) returned a higher daily-sick rate than the ratio for the whole European Army, the highest being 107·4 per 1,000 of average strength in the Gangetic Plain and Chutia-Nagpur group. Burma Coast and Bay Islands followed with 103·8, and Burma Inland with 95·4. The lowest ratio (75·8) was returned by the Deccan group. The death-rate of the entire Army was exceeded by eight groups, the Indus Valley returning the highest (16·91), followed by Hill Convalescent Depôts (16·69); that of Southern India (8·17) was the lowest.

Of the stations with a strength of over 1,000, six returned a higher death-rate than that of their Presidencies, viz., Peshawar 27·51, Quetta 21·44, Agra 21·31, Sialkot 18·38, Meerut 17·17, and Karachi 11·81.

Cholera.

There was a remarkable diminution in cholera cases. In the whole European Army the admissions to hospital from the disease numbered only 16 or 0·2 per 1,000 of average strength, against 167 or 2·5 per 1,000 in 1892, and the deaths 10 or 0·14 per 1,000, against 121 or 1·78.

Small-pox.

Among the whole of the European troops in India there were during the year under notice 33 cases of small-pox, of which four were fatal, two in Bengal and two in Bombay. In the previous year there were only 18 cases and three deaths.

Fevers.

From intermittent fever the admissions to hospital among the European troops in 1893 were in the ratio of 364 per 1,000 of strength against 429 in the previous year. The deaths under this head numbered 14, a decrease of 5 on the mortality of 1892. Of these, 8 occurred among the Bengal troops, and the remaining 6 were divided equally among the Madras and Bombay troops.

From enteric fever the admissions fell from 1,509 or 22·1 per 1,000 of strength, to 1,403 or 20·0, and the deaths from 376 or 5·52 per 1,000 to 371 or 5·29. Of the three armies, Madras was the only case in which the mortality under this head was

higher than in 1892. The other two armies showed a decrease, especially that of Bombay, which recorded 14 fewer deaths (50 against 64) than in 1892. The Bengal Army recorded an enteric fever death-rate of 6·40 per 1,000, the same as in 1892, the Madras Army 3·35 against 3·18, and the Bombay Army 3·70 against 5·03. As usual, young and unacclimatised soldiers were the chief sufferers, among those under 25 years of age the death-rate was 7·77 per 1,000 against 8·44 in 1892, while among men between 25 and 29, and from 30 to 34, the mortality was 2·91 and 2·08 per 1,000 respectively. Among men of less than two years' residence in India the death-rate from this fever fell from 10·69 to 9·88 per 1,000, among men of three to five years from 3·36 to 3·20, and among troops of from six to ten years from 2·15 to 1·89.

Bowel complaints.

The admissions from dysentery and diarrhœa among the European troops were in the ratio of 46 per 1,000 of strength or 13 per 1,000 less than in 1892. There were no deaths from diarrhœa, and the mortality from dysentery was in the ratio of 0·51. As in the previous year, dysentery was more prevalent in the Madras Army than in that of either Bengal or Bombay.

Venereal diseases.

Venereal diseases came first in the list of causes of admission to hospital, and also in the causes of invaliding. They were the cause of 33 per cent. of the total admissions during 1893, and 15 per cent. of the invaliding of the European Army of India. The ratio of admissions from venereal diseases per 1,000 of strength was 466 or 56 above that of 1892. In Bengal the admission-rate rose from 412 to 462 per 1,000, in Madras from 415 to 480, and in Bombay from 396 to 463. As regards the amount of non-efficiency due to venereal diseases, Dr. Rice, the Sanitary Commissioner with the Government of India, says: "Again and again medical officers insist upon the after "effects of venereal diseases subsequent to the men's discharge from hospital. They "speak of permanently impaired health, and remark very truly that a large number "of these men, although able after a fashion to get through their garrison duties, "would inevitably break down under the conditions of active service and become an "incumbrance to the force. A man who has had constitutional syphilis feels the "effects of it for years; indeed some authorities on this subject go so far as to state "that syphilis is never eradicated from the system. However this may be, in the "case of our short-service army, one may reasonably expect that a man who has "once contracted constitutional syphilis is not likely to be equal to the rigours of a "prolonged campaign during his future service. Some idea can be formed of the "amount of inefficiency due to this cause when it is considered that throughout the "European Army in India during 1893, there were, excluding the 590 cases of 'other' "venereal diseases and the 15 cases of venereal disease amongst troops on field "service (because in neither of these can the average duration be stated), 32,058 cases "of venereal disease, each of which remained in hospital for an average of 29·82 days, "amounting to a total loss of service of 956,110 days. During 1893 there were 2,619 "men, or the strength of nearly three regiments, constantly in hospital for venereal "diseases."

Invaliding.

The loss to the whole army by invaliding during 1893 amounted to 1,769 men, equal to 25·25 per 1,000, against 1,661 or 24·37 in 1892. The proportion of invalids to strength was, as in 1892, least in Bombay (22·05 per 1,000) and highest in Madras (26·09), that of Bengal being 25·99. Of the total number invalided, 39 per cent. were discharged as unfit for further service, being 1 per cent. less than in 1892. As regards the influence of age and length of residence in India upon invaliding, 57·43 per cent. of the total number invalided were under 25 years of age, against 53·41 in 1892, while 35 per cent. were of less than two years' service, and 80 per cent. were of less than five years' service. In the European Army as a whole 79 per cent. of the total strength had seen less than five years' service.

II.—NATIVE ARMY.

Sickness and mortality in 1893.

The health of the Native Army of India during 1893 was remarkably good. There was considerably less sickness, and the mortality was the lowest on record.

The ratios of sickness and mortality of each section of the Native Army of India for 1893 and the previous year are given in the following table :—

		Average Strength.	Ratio per 1,000 of Average Strength.			
			Admissions.	Daily Sick.	Deaths.	Total Deaths, including Absentees.
engal Native Army	1893	65,132	861	32	11·96	14·42
	1892	65,594*	1,234	40	16·53	19·70
ladras ditto	1893	26,170	743	34	12·19	15·43
	1892	25,963	868	38	18·53	26·00
ombay ditto	1893	23,626	1,121	33	6·60	8·84
	1892	23,355†	1,130	34	10·10	12·48
orps of Central India and Rajputana	1893	5,174	660	18	5·99	6·62
	1892	5,128	777	21	9·56	10·50
yderabad Contingent	1893	6,989	589	20	3·29	3·94
	1892	7,058	681	22	7·08	8·35
INDIA	1893	127,091	862	32	10·29	12·81
	1892	127,355	1,092	37	14·97	18·67

* Excluding certain men at Panjgur and on the march. † Excluding certain men on escort duty.

As usual the Hyderabad Contingent and the Central India Irregular Force were the ealthiest branches of the Native Army. The Madras Army returned the highest sick nd mortality rates.

The chief cause of sickness in the Native Army was ague, which yielded 38 per cent. f the total admissions against 48 per cent. in the previous year. Among the diseases rom which the admissions to hospital were higher than in 1892 were simple continued ever, respiratory and skin diseases; while from cholera, dysentery, and diarrhœa, and gue, there was a decrease in the admissions. From venereal diseases the admission-ate in the Native Army was only 36·4 per 1,000 of strength as compared with 466 er 1,000 among European troops. Pneumonia and other respiratory diseases were he chief causes of death in the Native Army, the ratios being 2·75 and 1·05 per ,000 respectively of average strength, against 3·26 and 1·01 in 1892. Fevers of all inds were the cause of 19 per cent. of the total deaths, against 48 per cent. among ie European troops. From ague, remittent and simple continued fevers, the deaths mong the Native troops were in the ratio of 1·87 per 1,000, while among the uropean troops the proportion was 0·70. On the other hand, the death-rate from nteric fever among the Native troops was only 0·04 per 1,000 as compared with 5·29 mong the European troops. Former statistics had shown the greater liability of ative troops to dysentery as compared with European troops, but from the returns f 1893 it would appear that the armies suffered about equally from this disease, for mong the European troops dysentery caused 4·1 per cent. of the total deaths, and mong the Native troops 4·6 per cent. But of all diseases, those of the respiratory rgans are the chief causes of death in the Native Army. From pneumonia the mortality of Native soldiers (2·75 per 1,000) was about four times as great as that of European troops (0·70 per 1,000). From cholera there were only 25 deaths, equal to 0·20 per 1,000 of strength.

Bengal Native Army.

The health of the Native Army of Bengal in 1893 showed a marked improvement. There was considerably less sickness, and the death-rate fell from 16·53 per 1,000 to 11·96. Ague caused 36 per cent. of the total admissions against 51 per cent. in 1892.

Pneumonia and other respiratory diseases were the chief causes of death, the former yielding 33 per cent. of the total deaths, and the latter 13 per cent.; the cholera death-rate was only 0·05 against 2·58 in 1892.

Corps of Central India and Rajputana.

The health of the corps of Central India and Rajputana (average strength 5,174) was much better than in the previous year. The admission-rate fell from 777 to 660 per 1,000, and the death-rate from 9·56 to 5·99. Ague was the cause of 43 per cent. of the total sickness. Respiratory diseases and remittent fever were the principal death causes, each having accounted for 29 per cent. of the total mortality.

Hyderabad Contingent.

The health of the troops composing the Hyderabad Contingent also was especially good. On an average strength of 6,989 the admissions to hospital were equal to 589 per 1,000 of strength against 681, and the death-rate was 3·29 against 7·08. Ague was the chief cause of sickness, yielding 45 per cent. of the total sickness; and respiratory diseases were the principal causes of mortality, representing 55 per cent. of the total deaths.

Madras Native Army.

The returns of the Madras Native Army showed a considerable improvement in the health of the troops. The ratio of admissions to hospital per 1,000 of an average strength of 26,170 was 743 against 868 in 1892, the daily sick-rate was 34, or 4 per 1,000 less, and the death-rate fell from 18·53 to 12·19 per 1,000. Ague caused 32 per cent. of the total sickness. From cholera there were 18 deaths, equal to 0·69 per 1,000, against 59 or 2·27 in 1892. Respiratory diseases and ague and remittent fever were the chief causes of each, each yielding 19 per cent. of the total deaths, followed by anæmia with a percentage of 12. Of the Native troops on service in Burma during 1893, the Madras Army furnished about 96 per cent. Among this portion the admissions into hospital were in the ratio of 1,092 per 1,000, the daily sick-rate 48, and the death-rate 19·85, all showing a considerable reduction on the ratios of the previous year.

Bombay Native Army.

The health of the Bombay Native Army during 1893 also improved greatly. On an average strength of 23,626 the admissions to hospital were in the ratio of 1,121 per 1,000 against 1,130 in 1892, the daily sick-rate was 33, or 1 per 1,000 less, and the death-rate 6·60 against 10·10 Ague caused 47 per cent. of the total sickness. Pneumonia was the chief cause of mortality, contributing 21 per cent. of the total deaths.

Groups of stations.

The following statement gives the principal statistics of the Native Army, arranged in geographical groups for 1893 :—

	Average Strength.	Ratio per 1,000 of Average Strength.		
		Admissions.	Daily Sick.	Deaths.
Burma Coast and Bay Islands	2,065	863	33	11·14
Burma, Inland	6,952	1,220	56	18·27
Assam	2,526	1,156	51	9·90
Bengal and Orissa	2,916	1,213	48	7·54
Gangetic Plain and Chutia-Nagpur	6,890	648	28	4·79
Upper Sub-Himalayan	16,337	684	30	12·06
Indus Valley and North-Western Rajputana	14,897	1,119	38	16·98
South-Eastern Rajputana, Central India, and Gujarat	13,193	855	27	5·53
Deccan	19,691	716	27	4·72
Western Coast	2,999	715	24	4·67
Southern India	8,717	472	26	8·03
Hill Stations	15,704	1,105	38	14·20

In six of the above groups the daily sick-rate was in excess of the ratio for the whole Native Army; and in five groups the death-rate was higher. The highest mortality was that of the Burma Inland group (18·27), which, however, was a great improvement on its rate (29·67) for the previous year.

III.—GENERAL POPULATION.

Vital statistics.

Births were registered throughout all the 10 provinces of India in 1893, and the birth-rates varied between 40·95 and 21·22 per 1,000 of population under registration. The best results were obtained in the North-Western Provinces and Oudh, Berar, and in the Central Provinces, their respective birth-rates being 40·95, 39·34, and 38·23; Bengal came next with 35·66; Bombay, 35·30; Punjab, 35·0, and Assam, 30·15. In all provinces except Assam and Coorg, the birth-rate exceeded the death-rate. The year was exceptionally healthy, and the recorded deaths fell from 6,920,816 or 32·47 per 1,000 of registered population in 1892 to 5,486,113 or 25·74. With the exception of Berar and Lower Burma, the number of deaths recorded in the several provinces was less than in 1892. Of the chief diseases, cholera was remarkably quiescent, and the total number of deaths from it was only 216,827, being the lowest figures recorded for some years, and a decrease of 507,188 on the deaths from the disease in 1892. The fall was general almost all over India, only Assam out of the ten provinces having recorded a somewhat higher mortality from the disease. "There "can be no question," the Army Sanitary Commission remark, "that there was a "general influence over the country which affected the one year very much and "affected the other very little; but once admit, as every one must, who has carefully "studied the facts, that such a general influence is largely concerned in the results, "although its nature is still beyond our comprehension, and the insufficiency of the "commonly received theories to account for cholera epidemics becomes apparent." There was a considerable diminution also in the deaths from fevers, which was participated in by all the provinces except Berar and Lower Burma. The mortality from small-pox and dysentery and diarrhœa was also lower than in the previous year.

The deaths from the chief diseases and from all causes in the several provinces were as follow:—

	Cholera.		Small-pox.		Fevers.		Dysentery and Diarrhœa.		Deaths from all Causes.		
	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000 of Population under registration.	
										1893.	1892.
Bengal	126,976	1·78	14,531	0·20	1,477,288	20·78	41,150	0·57	2,005,463	28·21	31·92
North-Western Provinces and Oudh	12,154	0·26	5,992	0·13	883,601	18·84	34,556	0·74	1,130,217	24·10	34·11
Punjab	639	0·03	4,085	0·20	389,506	18·95	16,150	0·79	578,176	28·13	49·48
Lower Burma	2,393	0·53	3,081	0·68	50,648	11·22	5,222	1·16	98,147	21·75	20·00
Central Provinces	557	0·06	1,602	0·17	169,918	17·88	13,001	1·37	263,143	27·70	34·14
Coorg	9	0·05	214	1·24	3,379	19·52	184	1·06	4,322	24·97	30·62
Assam	21,849	4·35	2,643	0·53	77,463	15·42	14,853	2·96	152,081	30·28	34·21
Madras	32,209	1·0	27,289	0·8	258,415	7·7	23,814	0·7	649,782	19·3	22·3
Bombay	18,853	1·00	3,567	0·19	361,160	19·19	32,965	1·75	511,831	27·20	32·50
Berar	1,188	0·4	174	0·06	45,548	16·0	14,772	5·2	92,951	32·6	28·8
Total	216,827	1·01	63,178	0·29	3,716,926	17·44	196,667	0·92	5,486,113	25·74	32·47

Bengal.

Considerable progress was made in the registration of births in the province of Bengal during 1893; but the improvement was not general, the birth-rates of several towns being lower than those for 1892. The births registered during the year under notice numbered 2,534,859, being in the ratio of 35·66 per 1,000 of population, a higher rate than that of 1892 by 7·60 per 1,000. The improvement is further shown in the fact that for the first time more births were registered than deaths in every division of the province. The Sanitary Commissioner (Dr. Gregg) points out that "Bengal through improved registration is fast gaining its true position in the list as "being one of the most prolific, as well as one of the most unhealthy provinces in "India. The people," he says, "are beginning to realise the importance of registra-"tion, and every year now shows a satisfactory progress." Compared with other

provinces, the birth-rate of Bengal in 1893 occupied the fourth place on the list, whereas in the previous year it stood sixth.

The year 1893 in Bengal was much healthier than the previous one, and the number of deaths registered fell from 2,247,275 or 31·92 per 1,000 to 2,005,463 or 28·21. The district death-rates ranged from 42·93 in Rajshahi to 16·78 in Singhbhum. In towns the average death-rate decreased from 32·75 in 1892 to 30·03, which was made up of figures ranging from 63·02 in Netrokona to 13·84 in Maniktola. Out of 147 municipal towns, 44 returned a death-rate in excess of the provincial rate; and of these, 15 recorded mortality-rates ranging from 41·42 per 1,000 to 63·02, all being considerably higher than in 1892. The mortality among infants continued to rise, being in the ratio of 187·38 per 1,000 against 171·36 in 1892, and a quinquennial average of 130·43. Among children between one and five years of age the death-rate was 36·56, against 43·57 in the previous year.

Of the chief diseases, cholera was much less prevalent, the mortality from it being less than half that of 1892. Throughout the province, 126,976 deaths were recorded from the disease in 1893 or the equivalent of 1·78 per 1,000 of population, against 261,417 or 3·67 in the previous year. Cholera visited every district, and attacked 22,444 villages, or about 10 per cent. of the total number. The most remarkable features of the cholera history of the year were the excessive mortality in the Dacca and Chittagong divisions, with death-rates from the disease of 5·67 and 3·32 per 1,000 respectively, and the immunity of the districts of the Orissa division, which of late years have suffered severely. Of the 46 districts the provincial rate was exceeded in 16, the highest being 7·27 in Dacca, 6·33 in Faridpur, and 5·62 in Noakhali. In five other districts (Pabna, Mymensingh, Malda, Rajshahi, and Tippera) the rates were above 4 per 1,000. The prevalence of the disease in Dacca was attributed to heavy floods, the inundations being the highest ever known, and the mortality the highest on record. Except at Puri there was a great absence of cholera at the fairs and festivals held during the year, which was "partly owing to the general sufficiency of drinking "water, and partly, no doubt, to the observation of strict sanitary precautions, which "are now almost everywhere enforced, and are accepted with a better grace than "before." It is not stated what the cholera mortality at the Puri festival was, but in the town there were 271 deaths, equivalent to nearly 10 per 1,000 of its population. Over 200,000 pilgrims attended the festival, many of whom had to camp out in the fields and under trees, there being no room in the lodging-houses of the town. "It is "self-evident," Dr. Gregg remarks, "that the exposure thus endured, supervening on "the privations of a long and dreary journey, must have rendered them peculiarly "susceptible to cholera in a district in which the water supply for years has been "polluted by a variety of nuisances."

The mortality from small-pox was also considerably below what it was in the previous year, the number of deaths having declined from 22,380 or 0·31 per 1,000 in 1892 to 14,531 or 0·20 in 1893. Insignificant though the mortality from this disease now is, Dr. Gregg thinks it ought to be even less; "indeed," he says, "it ought to be "practically extinct, and it would be so if vaccination were made compulsory and "actively enforced throughout the province." As in the previous year, small-pox was most prevalent in Puri and Cuttack, where great difficulty is experienced in carrying on the work of vaccination. The people, it appears, do not object to the operation, but to the payment of the vaccinator's fee of two annas for each successful operation. The death-rates of these two districts from the disease were respectively 2·59 and 1·12 per 1,000, but in none of the other districts did the mortality reach 1 per 1,000. Nearly 71 per cent. of the small-pox deaths occurred among children under 12 years of age, infants under one year furnishing 20·97 per cent., and children between one and six years 31·73 per cent.

Under fever 1,477,288 deaths were registered in Bengal, representing 20·78 per 1,000 of population, against 1,615,334 or 22·72 in 1892. But although the deaths were fewer in 1893 than in 1892 they were considerably in excess of the average of the last five years, which was 1,264,352 or 17·79 per 1,000. Dr. Gregg attributes the increase partly to improved registration and partly to the wide prevalence of malaria, which is chiefly caused by the want of drainage. He states: "After an experience of 22 years "spent in the study of the health of the people of Bengal, I have no hesitation in "saying that the crying want of the province is improved drainage, and that until "this is provided there will be no diminution in the death-rate from fever, which in "the present condition of things must go on increasing. The Drainage Bill, which "is now before the Bengal Legislative Council, has been conceived in the truest and "best interests of the people of the land, and I hope for their own good that nothing

" will prevent it passing into law." In striking contrast to the heavy fever mortality of the province of Bengal, Dr. Gregg instances the immunity enjoyed by jails from fever. Among a jail population of 17,721 in 1893, there were only 42 fever deaths or 2·37 per 1,000. The reason given is "that, in addition to the advantage which " prisoners enjoy of skilled medical treatment, the jails are well chosen, and thoroughly " drained, thus showing that malaria is a preventable disease." Of the 46 districts just a half recorded a higher fever death-rate than the provincial mean, Rajshahi coming first with 35·43, followed by Jessore 33·73, Malda 33·28, Murshidabad 30·85, Dinajpur 29·41, Nadia 28·99, and Jalpaiguri 28·11, all of which districts with the exception of Murshidabad were also the most fever stricken in 1892. The scheme which was started at the close of the previous year for the more extended supply in Bengal of Government quinine made up into 5-grain packets at one pice each was growing in popularity, and was being adopted by other provinces in India.

The number of deaths recorded under dysentery and diarrhœa in Bengal was 41,150 or 0·57 per 1,000, against 50,855 or 0·71 in 1892. As usual Darjeeling district showed the highest death-rate under this head, viz., 5·22 per 1,000, followed by Calcutta (4·22), Howrah (3·88), Balasore (3·27), and Puri (2·79). The urban death-rate (2·98) was considerably in excess of that in rural areas (0·45), which Dr. Gregg says " is doubtless " due to the crowding together of persons which leads to the fouling of the air, and " the water, and the soil—the three principal means by which infectious diseases " are propagated."

There was a slight improvement in the health of Calcutta in 1893 as compared with the previous year, the death-rate having declined from 29·60 per 1,000 to 29·51. This was due to the exceptionally low mortality from cholera, viz., 869 or 1·27 per 1,000, against 2,019 or 2·95 in the previous year. Under all the other principal diseases there was an increase in the deaths. From small-pox the deaths rose from 21 to 31, fever deaths increased from 7,618 or 11·17 per 1,000 to 8,091 or 11·87, and under dysentery and diarrhœa the mortality was 2,882 or 4·22, against 2,364 or 3·64 per 1,000. The deaths from fever were more numerous than in any year since the amalgamation of the suburbs with the town, and the Health Officer attributes the increasing mortality to defects in the drainage system, and urges alterations in the direction indicated by Mr. Baldwin Latham, who investigated the whole question some years since. "In view, however," it is stated, " of the more pressing necessity of a drainage system " in the suburban area, it is hardly possible at present to undertake any great and " costly changes in the town itself."

North-Western Provinces and Oudh.

The registration of vital statistics in the North-Western Provinces and Oudh in 1893 was on the whole satisfactorily performed, though the great variations in the results of some parts of the province show that there is still room for improvement. The year was exceptionally healthy and prosperous, and to these causes was attributed in a great measure the rise in the number of registered births from 1,696,427 or 36·17 per 1,000 of population in 1892 to 1,920,831 or 40·95 in 1893. The birth rate ranged from 26·60 in the Dehra Dun district to 51·29 in the Moradabad district. In 29 of the total 48 districts the rate was above that of the provincial average, and in nine districts it exceeded 45 per 1,000 of the population. In rural circles the average birth-rate was 40·94 as against 41·02 the average in towns. The births exceeded the deaths by 790,614 or 16·85 per 1,000, and the growth of the population during the year was about three times that of the decennial average. In all the districts except Naini Tal there were more births than deaths, but this district includes the Tarai, a noted fever tract,

There were 469,836 fewer deaths registered than in 1892, the number having decreased from 1,600,053 or 34·11 to 1,130,217, or 24·10, which is the lowest rate on record. The general death-rate in the districts, exclusive of the towns, fell from 34·06 to 23·68, which was made up of ratios ranging from 18·58 in Ghazipur to 37·52 in Moradabad. In the municipal towns the death-rate also declined from 34·82 to 29·78. There was a marked decrease in infantile mortality, the death-rate for the year under notice being 190·7 per 1,000 living against 219·5 in 1892.

The year was remarkable for its exemption from epidemics, and the death-rates from cholera (with one exception), small-pox, and fever were the lowest on record. From cholera there were only 12,154 deaths, equal to 0·26 per 1,000 of the population, as compared with 194,886 or 4·15 in 1892. Of the 48 districts the disease was only epidemic in three, viz., Garhwal, Gonda, and Bahraich, where the death-rates were respectively 3·74, 2·52, and 1·32 per 1,000. Two districts (Jalaun and Jhansi in the Allahabad division) were entirely free from cholera, and in six others the cases were

below five in each; while in the remaining 40 the mortality was less than 0·5 per 1,000, and in many instances considerably less. "It is instructive also to observe," the Army Sanitary Commission remark, "that, taking the province as a whole, no "month throughout the year was free from the disease, and yet its prevalence was "confined to the three districts named. Its localisation in these centres is well "worthy of notice. It will be seen on reference to the statistics, and still more "strikingly on the map, that neighbouring districts suffered little, and even in those "three in which it was epidemic the proportion of villages attacked was but a small part "of the whole. If we are ever fully to understand the causes of cholera, we must study "the events of a year such as 1893, in which the disease was comparatively rare, as well "as those other years in which it proved destructive." Of the 96 large towns of the province no death from cholera was recorded in 53, and 11 other towns reported only one death each from the disease. The average cholera death-rate in the towns was 0·18 per 1,000, and in the rural areas 0·27 as compared with 1·99 and 4·31 respectively in 1892. The five pilgrim centres of Benares, Fyzabad-Adjudhia, Muttra-Brindaban, Hardwar, and Allahabad, returned 340 out of the total 580 cholera deaths recorded in the towns of the province. Proportionately to population the mortality in these pilgrim centres was more than three times, and in Fyzabad-Adjudhia nearly ten times, that of the towns generally.

From small-pox there were only 5,992 deaths, equal to 0·13 per 1,000 of population, against 7,709 or 0·16 in 1892. Though all the districts were affected but one (Dehra Dun), Kheri was the only case in which the mortality (1·28) exceeded one per 1,000. In that district nearly one-fifth of the total deaths from small-pox in the province were recorded, and it is observed that with two exceptions the proportion of persons protected in it by vaccination was lower than in any other district. In Cawnpore district, with a population of nearly a million and a quarter, there were only two deaths from the disease. Of the 96 large towns of the province there were no deaths from small-pox in 42, and in 18 others there was only one death in each. "Looking at all the "evidence," the Army Sanitary Commission remark, "it seems very clear that it is "to the successful vaccination of more recent times that the marked diminution in "small-pox mortality is to be ascribed." Of the total 5,992 deaths from the disease all but 279 occurred among children under 12 years of age, infants under one year having contributed 1,726, and children between one and 12 years 3,987.

Fevers, or rather diseases recorded under this head, accounted for 78 per cent. of the total mortality, the deaths having numbered 883,601 or 18·84 per 1,000, against 1,168,077 or 24·90 in 1892. But the percentage of deaths from fever to total mortality varied considerably in the different districts, and regarding this variation the Sanitary Commissioner (Dr. Hutcheson) states: "The fever mortality as tabulated year after year "is, as regards most districts, virtually a statement of mortality from all causes, and the "actual deaths from the fevers of medical nomenclature do not ordinarily number more "than one-third of the total recorded mortality under this head." Among districts Naini Tal as usual recorded the highest fever death-rate of 32·35, followed by Moradabad with 31·25, the remainder varying from 28·55 in Shahjahanpur to 10·71 in Gorakhpur and 7·02 in Partabgarh. The ratio of mortality from fever in the towns was 20·27 as compared with 24·53 in 1892, and the rural rate was 18·73 against 24·93.

Under dysentery and diarrhœa there were registered 34,556 deaths, equal to 0·74 per 1,000 of population, as compared with 42,448 and 0·90 in the previous year. As usual the Garhwal, Almora, and Dehra Dun districts recorded the highest death-rates from these causes, viz., 7·60, 4·53, and 4·02 respectively, but the two first compare favourably with those recorded in 1892, which were 7·62 and 6·02. In the remaining districts the rate of mortality ranged from 1·80 in Moradabad to 0·04 in Basti and Bahraich. But "the mortality from dysentery and diarrhœa," Dr. Hutcheson says, "is much under-stated, and the approximate percentage of deaths from these causes is "probably 10 per cent. of the total mortality, instead of 3 as indicated in the returns "for the province generally."

Fewer births were registered in the Punjab during 1893 than in any previous year except 1891. The number recorded was 719,517, giving a birth-rate of 34·99 per 1,000 of population, against 784,356 or 38·16 in 1892. The explanations given by the Sanitary Commissioner (Surgeon Lieutenant-Colonel Roe) for this decrease are (1) that 1891 and 1893 were preceded by the exceptionally unhealthy years of 1890 and 1892 respectively, in which the highest death-rates were recorded since registration was commenced in the Punjab (1880); and (2) the rates of 1891 and 1893 were calculated on the increased population shown by the census of 1891. The diminution in the birth-rate was most

Punjab.

marked in the districts of Gujranwala, Gurdaspur, Sialkot, Hazara, Gujrat, and Jhang, where it varied between 7 and 14 per 1,000. The district of Sialkot has usually shown the highest birth-rate, but during the year under notice it fell to 39·5 from 50·8 in 1892. The provincial birth-rate was 6·86 per 1,000 more than the death-rate, and the excess was shared in by all districts except Simla, Kohat, Peshawar, and Amritsar, in which the deficiency amounted to 3·83, 2·39, 1·17, and 1·10 per 1,000 respectively. In some districts the excess of births over deaths was considerable, notably in Rohtak, Gurgaon, Karnal, Hissar, and Delhi, in which the increase was 20·41, 20·38, 16·77, 16·69, and 15·24 per 1,000 respectively.

The year 1893 was, on the whole, a healthy one in the province, and the deaths registered from all causes amounted to 578,176, equivalent to 28·13 per 1,000 of population, a fall of 438,847 or 21·35 on the mortality of 1892. Every district showed a large decrease, except Simla, where the circumstances are exceptional, and the death-rate of which was 23 per 1,000 in both years. The decrease was especially noticeable in Bannu, where the mortality fell from 66·69 to 23·27 per 1,000, and in Sialkot, Shahpur, and Gurdaspur, the rates of which were 30·97, 25·65, and 33·33, against 62·44, 56·58, and 63·18 respectively in the previous year. The only districts which recorded a much higher death-rate than that of the province as a whole were Amritsar, 37·01, and Lahore, 35·18. There was also a large decrease in the mortality among infants under one year of age, the death-rate per 1,000 having been 176·73 for males, and 169·35 for females; the corresponding ratios for the previous very unhealthy year were 257·63 and 249·72.

The province was remarkably free from cholera, and during six months of the year not a single death was registered from the disease. The deaths numbered only 639 against 75,959 or 3·70 in 1892. Nearly all the deaths (606) were recorded in the months of May and June. The districts most affected were Gujranwala and Montgomery, which returned 294 and 159 deaths respectively, equivalent to 71 per cent. of the total mortality from the disease registered in the province. Of the remaining 29 districts, in 13 not a single cholera death was recorded, and in 7 others there was but one fatal case in each.

In consequence of the allegation that cholera had been again disseminated from Hardwar, an inquiry was instituted under the orders of the Government of India, the result being that, although returning pilgrims may have been in some cases the first to fall victims to the disease, there was no evidence to prove that its spread in 1893 was due to them. Regarding this matter, the Army Sanitary Commission state: "All "histories of supposed importation of cholera require most careful investigation, and, "even when they seem to be fully substantiated, they must still be taken in connection "with the great facts which clearly point in the opposite direction. Of such facts "there could hardly be one more striking than that brought out in Form VII., from "which we learn that, during 1893, of 37,602 villages in the Punjab, only 80 returned "deaths from cholera."

From small-pox only 4,085 deaths were recorded, giving a death-rate of 0·20 per 1,000, which was the lowest ratio registered since 1867, excepting the year 1891, when the mortality was at the rate of 0·17 per 1,000. In the year 1892 the deaths from this disease numbered 11,173 or 0·54 per 1,000. The statistics of recent years show a gradual decrease in mortality from this disease. The average death-rate from small-pox during the 10 years ending in 1876 was 1·37 per 1,000, during the following 10 years the rate fell to 0·96, and during the last seven years, ending in 1893, it was only 0·51 per 1,000, results which the Army Sanitary Commission consider very satisfactory and testifying to the influence of vaccination in the protection of the people. The disease was present in all the districts, but in no case did the mortality reach 1 per 1,000, the highest rate being 0·61 in Karnal. Of the total 4,085 deaths, 3,606 or 88 per cent. occurred among children under 12 years of age, including upwards of 25 per cent. among infants under one year of age.

The deaths registered under fevers showed a marked diminution in number compared with the previous year, only 389,506 having been registered in 1893 against 715,890 in 1892. The death-rate was 18·95 or very little more than half that (34·83) registered in 1892. The decrease was shared in by every district, and in some cases the reduction was very considerable, especially in the five districts of Gurdaspur, Sialkot, Bannu, Mooltan, and Dera Ismail Khan, in each of which the fever death-rate was lower by over 20 per 1,000. One of the main causes of the heavy mortality of fever in the Punjab is said to be the saturation of the subsoil and the swamping of the surface of the country. The Local Government have therefore directed the Sanitary Commissioner to report fully on fever death-rates in swampy and water-logged districts, and he proposed to

devote a considerable portion of his next cold weather tour in investigating this important matter, and to give the results in his next annual report.

Dysentery and diarrhœa were also the cause of considerably fewer deaths, the number registered having declined from 21,781 or 1·06 per 1,000 in 1892 to 16,150 or 0·79 in 1893. In several districts the provincial rate was exceeded, and in many of the towns the mortality was very high. The average death-rate in the rural areas was 0·66 per 1,000, while that of the towns was 2·42. The highest death-rates from these causes among the urban population was recorded in the towns of Hoshiarpur (6·84), Pind Dadan Khan (6·51), and Kasur (6·11). The high mortality in these and other towns was attributed to malarial fevers, sudden changes of temperature, impure water, excessive consumption of melons and mangoes in their seasons, poverty, and, chiefly, insanitary conditions.

Burma.

The general results of the registration of births and deaths in Lower Burma during 1893 show that slight progress was made. The number of births registered was 117,462 or 26·03 per 1,000 of population, which was the highest rate on record, against 112,070 or 24·83 in 1892. That registration is yet in an unsatisfactory condition is shown in the still too low birth-rate, and the wide variations in the returns from different districts, which ranged from 37·53 in Sandoway to 16·52 in Shwegyin. In the towns there were still greater differences. Of those with a population of over 5,000 the average birth-rate was 22·51, which was made up of town ratios ranging from 43·37 in Thaton to 15·91 in Rangoon. But the Sanitary Commissioner (Brigade-Surgeon Lieutenant-Colonel D. Sinclair) remarks, "it is but reasonable to expect a "lower birth-rate in towns, where out of a population of 544,034 the males exceed "the females by 123,248."

The deaths were more numerous than in the previous year by 7,914, the number registered in 1893 being 98,147, equal to 21·75 per 1,000 of population, against 90,233 or 21·0 in 1892. The increase was attributed to improved registration, as the year on the whole was not considered more unhealthy than that of its predecessor. The provincial death-rate was made up of district rates ranging from 13·33 in Shwegyin to 31·42 in Thayetmyo and 31·63 in Prome. Of the total deaths, more than a fifth (21,300) took place amongst infants under one year of age.

Cholera, though present in the province throughout the year, was considerably less fatal than in 1892. The deaths registered from the disease declined from 6,208 or 1·38 per 1,000 to 2,393 or 0·53. Mergui district enjoyed complete immunity, and in the districts of Shwegyin, Amherst, and Toungoo the mortality was unimportant; in the remaining 13 districts the death-rate ranged from 2·05 in Prome, and 1·41 in Thayetmyo, to 0·04 in Pegu. Out of a total of 17,414 villages cholera deaths were registered only in 547. The Sanitary Commissioner reports that "the spread of the "disease appears to have been to some extent limited by the sanitary measures which "are always taken on the appearance of the pestilence. Its usual endemicity amongst "insanitary surroundings is the chief feature of the disease."

The number of deaths registered from small-pox in Lower Burma was 3,081 or 0·68 per 1,000 of population, against 1,463 or 0·32 in 1892. Nearly half the deaths (1,530 or 3·68 per 1,000) were reported from Akyab district. The next highest rate was recorded in Sandoway, 1·19 per 1,000, Kyaukpyu came next with 0·99, followed by Hanthawaddy and Thongwa districts with rates of 0·90 and 0·84 respectively. In Tavoy and Toungoo districts no deaths from the disease were recorded, and in those of Thayetmyo and Prome the mortality was insignificant. Of the total small-pox mortality in the province children under 12 years of age contributed 60 per cent., including 17·8 per cent. by infants under one year.

The mortality from fevers was the highest on record, but this was largely attributed to greater accuracy in registration, especially in rural tracts. The deaths numbered 50,648 or 11·22 per 1,000, as compared with 44,422 or 9·84 in 1892. Among the districts the highest ratios were those of Prome (21·38), Thayetmyo (18·13), and Akyab (16·07), and the lowest were recorded in Pegu (5·71) and Thongwa (5·55). For the urban areas the mean fever death-rate in 1893 was 8·68, and for rural areas 11·57, against 8·58 and 10·02 respectively in the previous year.

The number of deaths recorded under dysentery and diarrhœa was 5,222, equal to 1·16 per 1,000, against 5,449 or 1·21 in 1892. The highest rates were returned by Tavoy (4·13), Akyab (2·28), and Thayetmyo (2·16). The diseases were most fatal during the months of July, August, June, and September, "a period in which "suspended matter in the water is in largest amount, fruit and vegetables plentiful, "and most of the deltaic country is water-logged and in the condition of a morass."

Central Provinces.

Although the general conditions of the year 1893 in the Central Provinces are reported to have been on the whole favourable to the health of the people, there was no improvement in the birth-rate of the province. The number of births registered during the year was 363,209 against 364,745 in 1892, and the birth-rate 38·23 per 1,000 as compared with 38·39. The small decrease, however, was confined mainly to the rural parts of the province, as the town ratio rose from 31·51 to 33·55. Of the 20 districts there was an increase of births in 11 and a decrease in six, while in three the birth-rate was nearly the same. The highest rate (47·64) was recorded by Nimar, and the lowest (33·29) by Wardha. There was an excess of births over deaths in all districts, the ratio for the province being 10·53. In the number of deaths registered there was a decrease of 61,205, the total for the year being 263,143 or 27·70 per 1,000 of population, which was the lowest ratio since 1884 and 6·44 less than that of 1892. The decrease was spread over all the chief diseases except small-pox, but was mainly due to the absence of epidemic cholera. The district rates varied from 22·98 in Sambalpur to 33·73 in Narsinghpur. There was a diminution of mortality in all the districts except Narsinghpur, Burhanpur, and Chhindwara, the most marked cases being Raipur with a lower death-rate by 19·21, Sambalpur 17·66, and Bilaspur over 15 per 1,000 of population.

There was a remarkable abeyance of cholera in the provinces during the year, and the deaths due to the disease fell from 39,972 or 4·21 per 1,000 in 1892 to 557 or 0·06. No deaths were recorded from cholera in nine districts, and in all the other districts with the exception of Chhindwara the mortality was much lower than it was in the previous year. In several districts the outbreak was attributed to returning pilgrims; but the evidence in all, the Army Sanitary Commission observe, is most meagre and is contradicted by the general history of the year. "The cholera problem," they state, "is far more difficult of solution than these district reports would have us believe, and "it cannot be too strongly impressed on all concerned that the only way of dealing "with it which can ever yield satisfactory results is to collect the facts year by year "accurately and in the fullest detail, especially as regards the history of first cases, "and to draw no conclusions which these facts do not warrant."

The number of deaths reported as due to small-pox was 1,602 or 607 more than in 1892. In spite of this increase the death-rate of 1893 (0·17 per 1,000) was, with the exception of those of the two previous years, the lowest on record. There was no serious outbreak of the disease in any part of the province, and the only district in which the mortality was at all high was Damoh, where 0·61 per 1,000 of its population is stated to have died from the disease. No small-pox death was recorded in Nimar, Burhanpur, and Chhindwara, and only one in Murwara. "These results," the Sanitary Commissioner (Surgeon-Colonel Ross) observes, "speak well for the "vaccination work of the province. It is probable that all eruptive fevers are "entered as small-pox. The supervision of vaccination by Civil Surgeons in the Central "Provinces is extremely efficient and extensive, and the immunity from this fearful "disease that the people enjoy is due to it."

The deaths reported as due to fevers show a considerable decrease on the figures of the previous year, the number having fallen from 188,017 or 19·79 per 1,000 in 1892 to 169,918 or 17·88 in 1893. The decrease of 18,099 was spread over 14 of the total districts, in the remaining six there was an increase of fever mortality. The district rates varied from a maximum of 27·43 per 1,000 in Nimar to a minimum of 6·50 in Sambalpur. Registration under this head, however, appears to be very backward; for the result of an inquiry made by Civil Surgeons into the causes of 12,634 deaths, showed that only 52·60 per cent. were attributed to fever, and a similar inquiry made by police into 12,715 deaths yielded a percentage of 59·85 due to fever.

The deaths registered under dysentery and diarrhœa amounted to 13,001 or 1·37 per 1,000, against 16,021 or 1·69 in 1892. Among the districts the highest death-rate (3·24) was recorded by Sambalpur, and the lowest (0·13) by Bhandara; but in almost all the districts the death-rates from these causes were lower than in the previous year.

Assam.

Notwithstanding the steps taken in Assam in the years 1891 and 1892 to improve the registration of vital statistics, the records of births and deaths in 1893 do not point to any advance towards accuracy. "The statistics, so far as they go," the Chief Commissioner of the province observes, "are not without their value, but at the stage "which sanitary enquiry in this country has now reached, the improvement of the "registration is a matter of very great importance, and one which demands the "constant attention of all officers concerned."

During the year there were 151,391 births registered, yielding a ratio of 30·15 per 1,000 of population, as compared with 155,909 or 31·05 in 1892. The Sanitary Commissioner (Dr. Warburton) believes an estimated birth-rate of 40 per 1,000 for the whole province to be below the mark. Goalpara headed the districts with a rate of 36·68, followed by Sylhet with 32·99, and Cachar with 30·26. The remainder varied from 29·27 in Lakhimpur to 21·73 in Nowgong. The only districts which showed an increase were Cachar (2·47) and Lakhimpur (1·70). The number of deaths registered was 152,081 or 30·28 per 1,000, against 171,784 or 34·21 in 1892. The district rates ranged from 19·50 in the Khasi and Jaintia Hills to 41·93 in Nowgong. The latter district was the only one in which the mortality was higher than that recorded in the previous year, and its death-rate exceeded the birth-rate by 20·20 per 1,000.

Cholera was again very prevalent in the province, and the deaths rose from 21,552 or 4·29 per 1,000 in 1892 to 21,849 or 4·35 in 1893. The disease prevailed most severely in Nowgong, Cachar, and Sylhet, which returned death-rates under this head of 9·77, 6·89, and 4·87 respectively, against 1·89, 3·03, and 4·97 in 1892. In the remaining districts the rates ranged from 3·69 in Lakhimpur to 1·14 in the Khasi and Jaintia Hills. Dr. Warburton remarks: "If cholera has not always been an endemic "disease in the Surma and Brahmaputra Valleys, it has now become one, for during "the last 15 years it has never been absent, and there can be no doubt that its presence "is kept up by the bad sanitary conditions which prevail in almost every village in the "country, and which, owing to want of funds, very little has been done to remedy. "A pure water-supply is the first and greatest need, for where this exists, as in "Shillong and the Silchar cantonments, cholera only occurs as imported cases, and "the soil being unsuitable, it does not spread." The Chief Commissioner fears this conclusion is correct, but "how this pure water supply is to be provided all over the province," he says, "still remains for solution."

Although the deaths registered from small-pox rose from 1,452 or 0·29 per 1,000 of the population in 1892 to 2,643 or 0·53, the disease was not generally prevalent in the province, for no less than 2,083 of the deaths were reported from certain portions of the Goalpara district in which it is said the people persistently refuse vaccination. Only 560 deaths occurred in all the other districts. Not a single death from small-pox was reported in the *sadr* towns, which was attributed, in a great measure, to the large increase in the number vaccinated in 1892–93 as compared with the previous year. Of the 2,643 deaths 62 per cent. occurred among children under 12 years of age.

Deaths from fever were registered to the number of 77,463, being equal to 15·42 per 1,000 of the population, against 93,971 or 18·72 in 1892. Of the nine districts in Assam, the highest fever death-rate of 27·41 was recorded by Nowgong, the next being 24·63 in Goalpara, 22·22 in Kamrup, and 20·34 in Darrang; in the remaining districts the rates were below the provincial mean. In every district, except Nowgong, the fever death-rate was lower than in the previous year. In this particular case the increase was due to *kala azar*, from which there were 5,407 deaths registered, against 865 in 1892. Further investigations were made during the year under notice in regard to the prevalence of *kala azar* in various parts of the province, but no satisfactory conclusion as to the nature of the disease has been arrived at, and the further scientific enquiry into its causation has been deferred, for the present, for want of funds. The Chief Commissioner observes that "whatever differences of theory may exist as to the "causation of the disease, for practicable purposes there is only one available remedy— "the sanitary improvement of the area affected." It is noticed that in order to attain this object steps have been taken to impress clearly upon the Municipal Commissioners their obligations in respect of the improvement of the water-supply, drainage, and conservancy of their towns, and that as regards rural tracts, the Local Boards are to be required to set apart annually a proportion of their funds for the provision of pure water supply and for village sanitation.

Under dysentery and diarrhœa 14,853 deaths were registered, representing 2·96 per 1,000 of population, against 15,685 or 3·12 in 1892. The district rates ranged from 6·64 in Lakhimpur to 0·71 in Goalpara.

Madras.

In spite of all that has been done in Madras to improve the registration of vital statistics, it still remains very defective. The birth returns of 1893, however, show an improvement on those of the previous year, though they were not so favourable as those of 1891. During 1893 the number recorded was 909,153, being equal to 27·0 per 1,000 of population, against 845,029 or 25·1 in 1892. In the several districts the birth-rates ranged from 18·1 in Ganjam to 35·6 in Chingleput, in three other districts the rates

were over 30 per 1,000. Out of the 22 districts in the Presidency 15 returned higher rates than in the previous year. The birth-rate exceeded the death-rate in all districts except Madras and Cuddapah. The year was, on the whole, a healthy one, and the mortality was lower than in any of the preceding four years. A total of 649,782 deaths was registered in 1893, giving a ratio of 19·3 per 1,000, as compared with 750,755 or 22·3 in 1892. Among districts, Madras recorded the highest death-rate (41·4), next came Tanjore with a rate of 27·1, seven other districts recorded a rate of over 20 per 1,000, and in the remaining 11 districts the rate varied between 19 and 12 per 1,000. The mortality amongst infants was equal to 156·6 per 1,000 of the registered births; Dr. King, the Acting Sanitary Commissioner, attributes the high death-rate of infants to the insanitary conditions which surround them, and especially to the drastic treatment to which the new-born child is subjected owing to the ignorance of mothers. The average death-rate of the municipal towns was 31·1 per 1,000 which was made up of extremes varying from 46·9 in Cuddapah, and 41·1 in Madras to 18·0 in Nellore.

Of the chief diseases cholera was prevalent in the Presidency throughout the year, and no district was free from it. The mortality, however, was smaller than that recorded in any year since 1887, and less than half that of 1892, the deaths having declined from 79,033 or 2·3 per 1,000 to 32,209 or 1·0. The districts most affected were Tanjore and Trichinopoly, which recorded death-rates from cholera of 4·8 and 4·7 per 1,000 respectively; Kistna followed with a rate of 1·6 and Coimbatore with 1·1. In the other districts the death-rates varied from 0·8 per 1,000 in Salem to 0·002 in Bellary. With the exception of Tanjore, Trichinopoly, and Coimbatore the mortality was less, and in many districts considerably less than that recorded in 1892. In their remarks under this head the Army Sanitary Commission instance some of the main evils favourable to cholera, which exist more or less all over the Presidency, "and it is to the remedying of these," they say, "that the efforts of the Sanitary Department "should be directed. We are glad to note that so much is being done in the Madras "Presidency towards this great and difficult work."

From small-pox 27,289 deaths were registered, representing 0·8 per 1,000 of the population, against 43,757 or 1·3 in 1892. Nearly half the deaths (12,068, or 4·6 per 1,000) were returned from the Malabar district; excluding this district the average rate of the others was only 0·49 per 1,000. Dr. King ascribes the high rate of Malabar to the great mortality among the Moplahs, whose dislike to vaccination and habit of living in crowded houses render them peculiarly subject to small-pox. In only two other districts was the mortality at all high, viz., Bellary 1·1 per 1,000, and Godavari 1·0; the rates of the remainder ranged from 0·8 in South Arcot to 0·04 in Madras. Infants under one year of age contributed over 11 per cent. of the total small-pox deaths, and children between one and twelve years 26 per cent.

Of the total registered deaths nearly 40 per cent. were ascribed to fevers, the number recorded in 1893 being 258,415 or 7·7 per 1,000, against 280,627 or 8·3 in the previous year. Of the districts the highest fever death-rate was returned by Cuddapah (19·8), followed by Kurnool (18·4), Madras (15·0), Nilgiris (14·8), Vizagapatan (11·9), and Bellary (10·5), the remainder ranged from 9·5 in Ganjam to 2·2 in Tanjore. "The "term fever," Dr. King oberves, "covers a multitude of complaints in the estimation of "those responsible for registration, both in rural and urban areas. Pneumonia (which "is a common affection in malarial countries) passes under this designation, as well as "phthisis, which is also a prevalent disease—more especially in town populations—and "even dysentery, if the febrile condition be a permanent sympton, may be registered "under this head. Nevertheless, the majority of the so-called fevers are of malarial "origin. This being so, it is not surprising that results differ greatly according to "locality."

The deaths attributed to dysentery and diarrhœa numbered 23,814, yielding a ratio of 0·7 per 1,000 of population, against 32,293 or 1·0 in 1892. The district rates ranged from 2·3 in Chingleput to 0·2 in Kistna. The average death-rate of rural tracts was only 0·5 per 1,000, while that of urban circles was 3·1. This marked difference, Dr. King points out, shows how much these diseases are influenced by the insanitary conditions of town life, and more especially by the foulness of soil in the more thickly inhabited areas.

Bombay. In the Bombay Presidency 664,305 births were registered during 1893, which is an increase of 13,638 on the number recorded in the previous year, and the rate per 1,000 of the population rose from 34·57 to 35·30. Of the 24 districts 15 recorded higher birth-rates than in 1892. The average rate of the Presidency was exceeded in 11 districts, and seven of these returned rates of over 40 per 1,000, the highest being 47·24 in Khandesh and 46·12 in Nasik; in the other districts the birth-rates ranged from

39·83 in the Panch Mahals to 18·48 in Bombay City. The birth-rate of the Presidency was greater than the death-rate by 8·10 per 1,000. The total number of deaths registered fell from 611,742 or 32·50 in 1892 to 511,831 or 27·20. Among the districts the highest rates were recorded by Broach (38·00) and Ahmednagar (37·29), and the lowest by the five Sind districts, in all of which the rate of mortality was below 20 per 1,000. In all the districts but three (Khandesh, Ahmednagar, and Sholapur) the death-rates were lower than in 1892. Of the total deaths 110,766 or 21·64 per cent. were infants under one year of age, and 112,036 or 21·89 per cent. were children between one and five years.

Of the chief diseases cholera was very much less prevalent than in 1892, and the deaths fell from 42,900 or 2·28 per 1,000 to 18,853 or 1·0. In the three districts of Hyderabad, Upper Sind Frontier and Shikarpur no cases occurred, and in several others the mortality was very low. In some districts, however, the disease prevailed to a considerable extent, especially in Surat, Broach, and Sholapur, which recorded death-rates from it of 5·78, 3·36 and 2·34 respectively. Exclusive of the towns the average death-rate of the districts from cholera was 1·01 per 1,000, while that of the towns was 0·98. In 27 of the 63 towns there was no death from the disease, and in Karachi there was but one fatal case, which was the only death from it in the district of the same name. In the affected towns the highest rates were 14·08 in Pandharpur, 13·14 in Dohad, and 8·41 in Kaira, and 5·00 in Surat; in four other towns the rates were over 3 per 1,000, and in the remainder they varied from 2·51 to 0·09. As noticed by the Army Sanitary Commission, the disease in many places was associated with very marked insanitary conditions, especially in those towns of heavy mortality quoted above.

The number of deaths registered from small-pox rose from 2,770 or 0·15 per 1,000 in 1892 to 3,567 or 0·19 in the year under notice, but no district was specially affected. The highest district rates were 0·78 in Thana and 0·55 in Kolaba. The districts of Broach, Hyderabad, Thar and Parkar and Upper Sind Frontier were free from the disease. The Army Sanitary Commission notice that in one of the rural circles in Thana district the ratio obtained a maximum of 10·08 per 1,000, but in no other circle was there any approach to this, and the instances were very rare in which the ratio equalled 1 per 1,000, which the Commission say "is satisfactory, and bears *primâ facie* evidence to the good work of the vaccination staff." Of the total 3,567 small-pox deaths 24·67 per cent. occurred amongst infants under one year of age, and 54·25 per cent. amongst children between 1 and 12 years.

The deaths recorded under fevers were fewer than in 1892 by 76,878, the total number having fallen from 438,038 or 23·27 per 1,000 to 361,160 or 19·19. In every district, except Khandesh and Ahmednagar, there was a marked decrease on the mortality of the previous year, still in 11 districts it was in excess of the average rate of the Presidency. Broach headed the districts with a fever death-rate of 30·57 against 35·06 in 1892, followed by 28·22 in Kaira, 27·84 in Ahmedabad, 25·82 in Ahmednagar, and 25·53 in Khandesh, while Ratnagiri and Bombay returned the lowest rates, 10·97 and 7·21 per 1,000 respectively.

Under dysentery and diarrhœa there were registered 32,965 deaths, representing 1·75 per 1,000 of population, as compared with 35,406 or 1·88 in 1892. In nine districts the mortality was slightly higher, and in the remainder it was below that of 1892. The highest ratios were returned from Belgaum 4·28, Nasik 4·03, and Khandesh 3·75; while the lowest were 0·02 in Panch Mahals and 0·03 in Shikarpur.

Berar.

Registration of vital statistics in Berar is considered to be fairly good, and annually improving. During 1893 there were 111,924 births registered, giving a ratio of 39·3 per 1,000 of population, as compared with 113,640 or 39·9 in the previous year. The Sanitary Commissioner, Dr. Little, attributes the decrease to the unhealthiness of the province in 1891, and to the high price of jowari, the staple food of the poor in 1892, which delayed a return to physical vigour in the year under notice of those enfeebled by illness. In the districts the birth-rates varied considerably. Ellichpur, Akola, and Buldana returned rates of over 43 per 1,000 each, Amraoti 39·3, Basim 35·9, and Wun 29·6, the low rate of the last being due to defective registration, which, however, was receiving due attention with a view to improvement. The total number of deaths registered in the province was 92,951 or 32·6 per 1,000, an increase of 10,827 or 3·8 per 1,000 on the mortality of 1892. According to districts the highest rate was returned in Ellichpur, 39·9, and the lowest in Wun, 27·4. The urban death-rate was 32·4, which was made up of town rates varying from 47·2 in Sirasgaon to 24·8 at Mehkar.

For the first six months of the year the province was perfectly free from cholera. At the close of July the disease appeared in the districts of Akola, Amraoti and Buldana, and in the following month the remaining three districts became affected. The total cholera deaths fell from 2,030 or 0·7 per 1,000 in 1892 to 1,188 or 0·4 per 1,000. Of these 1,047 occurred in the months of August, September and October. By districts the death-rate from the disease varied from 0·6 per 1,000 in Akola to 0·2 in Wun, but only in Basim was the mortality from it greater than in 1892. Out of the 36 towns in the province 11 only suffered from cholera.

From small-pox the registered deaths rose from 68 in 1892 to 174. Of these 134 were returned from the district of Buldana, 19 from Amraoti and 10 from Akola; in neither of the other three districts did the deaths exceed five. The towns furnished but eight of the total small-pox deaths, and only in one of the rural circles did the mortality reach 1 per 1,000. "All this" the Army Sanitary Commission observe, "especially when considered in the light of the experience of Berar over a long series "of years, is convincing proof of the benefits which vaccination has conferred and is "now conferring on the people of the province in protecting them from small-pox." Of the total deaths ·96 per cent. occurred amongst children under 12, including 35·6 per cent. amongst infants under one year of age.

Deaths registered under fever amounted to 45,548 or 16·0 per 1,000, against 41,661 or 14·6 in 1892. The district rates ranged from 20·3 in Wun to 12·3 in Buldana. Regarding the distribution of fever in the province Dr. Little states: "The malarial "or telluric poison, to which the greater part of this fever mortality is due, is more "prevalent in certain tracts than in others, as, for instance, at the base of hill ranges, "where there is much vegetable deposit in the soil brought down from the hills (thus "the tract of country extending along the northern boundary of the province, including "the circles of Ellichpur, Anjangaon, Akot, Telhara, and Jalgaon); and again those "tracts where there is much uncultivated land, or where it has recently been cleared "for the purposes of cultivation. In these tracts the opening of new land produces "malaria, but which lessens by degrees as cultivation improves. Of this condition "the Wun district is an example. Though these general conditions of surface and "subsoil account, in a great measure, for the prevalence of fevers on certain tracts "more than on others, yet a considerable part of the mortality is doubtless due to an "aggravation of the disease by purely local causes, operating in and around dwellings "which a better sanitary condition would do much to mitigate."

The number of deaths registered under dysentery and diarrhœa was 14,772 or 5·2 per 1,000, against 11,200 or 3·9 in 1892. Each district contributed to the increase, but only two out of the six recorded a higher death-rate than the provincial average, Ellichpur having returned 10·3 and Akola 8·1. The comparative low rate in Wun district (1·2 per 1,000) is ascribed to the lower range of temperature prevailing in the uplands of Berar.

IV.—JAILS.

Sickness and mortality in 1893.

The health of the jail population of India showed considerable improvement in 1893. In the ratios of admission into hospital and daily-sick there was a marked decrease as compared with the previous year, the former having fallen from 1,117 to 907 per 1,000 of average strength, and the latter from 38 to 35 per 1,000; the death-rate also fell from 35·94 to 24·30, which was the lowest on record. Of the ten provinces, all but Coorg and Berar returned a lower jail death-rate than in 1892, the most noticeable cases being Madras and the Central Provinces. From cholera there were only 92 deaths as compared with 510 in 1892. In the jails of the Punjab, Berar, and Coorg, there were no deaths from this disease. There were also fewer deaths from fevers, and dysentery and diarrhœa.

The following statement shows the sickness and mortality among all classes of prisoners in the jails and subsidiary jails of the several provinces for 1893, as compared with the previous year:—

Provinces.	1893.			1892.		
	Ratio per 1,000 of Average Strength.			Ratio per 1,000 of Average Strength.		
	Admissions.	Daily Sick.	Deaths.	Admissions.	Daily Sick.	Deaths.
Bengal	1,040	36	32·33	1,179	40	43·78
North-Western Provinces and Oudh	696	34	17·17	931	41	29·14
Punjab	1,579	40	26·60	2,199	47	30·54
Burma	894	49	24·65	934	39	33·10
Central Provinces	803	28	19·01	945	31	44·66
Assam	1,414	47	46·99	1,913	55	58·97
Coorg	850	31	75·56	1,143	47	30·34
Madras	510	22	23·19	724	25	45·14
Bombay	807	29	25·44	787	29	36·52
Berar	860	27	28·00	575	16	17·16
India	907	35	24·30	1,117	38	35·94

Bengal.

Much has been done to promote sanitation in the prisons of Bengal. During 1893 a special committee was engaged in considering the conditions of the most unhealthy jails, and effect is now being given to their recommendations. The most important of these relate to food, clothing, and ablutions of the prisoners, and the conservancy and ventilation of the jail. The purity of the water has received much attention. Chemical analysis of drinking waters has been continued, pumps and pipes have been supplied to many jails, and improved methods of transportation to prevent contamination have been adopted. The statistics of sickness and mortality show that on the whole the prisoners enjoyed much better health than in the previous year. The admissions into hospital were in the ratio of 1,040 per 1,000 of average strength against 1,179 in 1892, the average daily sick-rate was 36 or 4 per 1,000 less, and the death-rate fell from 43·78 to 32·33. Though the mortality is still high, there has been a steady and continuous improvement on the whole for some years. The death-rate has fallen to less than one half what it was a quarter of a century ago. It must not be forgotten that the mortality in jails is swollen by the number of sick and weakly persons who are sentenced to imprisonment, for it is shown that out of 527 convicts who died in jail during 1893 only 155 or 29·4 per cent. were admitted into jail in good health. Among all classes of prisoners there were 573 deaths, and of these 225 resulted from dysentery and diarrhœa. From cholera the deaths declined from 68 to 21. The mortality among convicts, however, was still excessive in some jails, notably in Puri 111·7 per 1,000, Khulna 89·3, Jessore 86·2, Bankura 76·0, Midnapore 69·1,

Mymensing 56·3, and Burdwan 52·0. The majority of the deaths in these jails were of convicts who were received in bad or in indifferent health. In eight other jails the mortality exceeded 40 per 1,000, and in eight more it was higher than the average death-rate (32·9) among convicts. The causes of mortality at Puri, Jessore, and Mymensingh, have been recently inquired into by a committee appointed for the purpose, but at the close of the year the result had not been communicated to the Local Government. The high death-rate in the Bankura (76·0), Darbhanga (46·0), Gaya (40·8), and Hazaribagh (40·3) jails was due chiefly to the transfer from the damp unhealthy districts of Eastern Bengal of prisoners suffering from malarious diseases.

North-Western Provinces and Oudh.

The year 1893 in the North-Western Provinces and Oudh was exceptionally healthy, and the improvement in the health of the jail population as compared with the previous year was very marked. The admissions into hospital were much fewer than in the previous year, and the ratio declined from 931 to 696 per 1,000 of average strength; the daily sick-rate fell from 41 to 34 per 1,000, and the death-rate from 29·14 to 17·17, which was the lowest on record and "unprecedented in the vital statistics of jails in India." All but 30 of the total 457 deaths occurred amongst convicts, the death-rate being 17·34 per 1,000 of strength. The mortality was high among convicts in the jails of Almora, Bulandshahr, Banda, and Azamgarh, which recorded rates of 66·66, 66·57, 54·91, and 47·13 respectively. In six other jails the mortality ranged between 38·46 and 30·03, and in seven more the average death-rate of convicts was exceeded. With the exception of Unao (30·03), all the jails in which the mortality among the convict population was above 30 per 1,000 in previous years had ordinarily recorded death-rates above the average. Several jails which have had a bad record in the past were decidedly healthy in 1893, notably Aligarh, Ghazipur, Gonda, Cawnpore, Basti, and Saharanpur. Progress was being made with the new jail at Gorakhpur. At the old jail the death-rate was 62 per 1,000, while amongst the prisoners engaged during the year in erecting the new jail the mortality was only 14 per 1,000, results which, the Inspector-General of Prisons observes, demonstrate the urgency of completing the new and abandoning the old jail as expeditiously as possible. There was only one death from cholera among the entire prison population of the province, and this occurred at the Benares Central Prison.

Punjab.

The health of prisoners in the Punjab during 1893 was on the whole satisfactory. The ratio of admissions into hospital per 1,000 of average strength declined from 2,199 to 1,579, the daily average sick-rate from 47 to 40, and the death-rate from 30·54 to 26·60, which is the lowest rate on record for 25 years. This general improvement was ascribed to the more favourable climatic conditions that prevailed during the year under review. The average death-rate was exceeded in 10 jails, Peshawar coming first with 100·76, followed by Amritsar 71·11, Gurdaspur 52·38, Mooltan Central 49·04, Lahore District 46·76, and Rawalpindi 33·60. Of the total 330 deaths 315 were of convicts, the ratio being 26·79 against 30·73 in the previous year. The chief causes of death were respiratory diseases, dysentery and diarrhœa, and fevers. There was a large increase in the admissions under the first of these heads, but the number of deaths fell from 155 in 1892 to 134, "due apparently to the milder form of "pneumonia that attacked the prisoners." The number of admissions from intermittent fever fell to about half what it was in 1892 (from 18,482 to 9,815), and the deaths from 13 to 7, a result mainly ascribable to the healthiness of the year, more especially in the autumnal months. The decrease in the deaths from dysentery and diarrhœa from 69 to 54 was also ascribed to the same cause. Among other fevers there were 164 admissions from typhus fever with 25 deaths, which occurred during the first half of the year in the Rawalpindi and Peshawar jails. "The occurrence of "typhus fever," Dr. Rice, the Sanitary Commissioner with the Government of India, writes, "is peculiar to the jails of the Punjab; there was not a single case amongst "prisoners in any other part of India. . . . There can be little doubt that this "disease is introduced from outside the jails as it is not unfrequently epidemic in "some of the filthy villages on both sides of the Punjab frontier, especially in the "direction of Swat." As soon as the disease was recognised every case exhibiting suspicious signs was isolated outside the prison walls, and measures were taken to increase the ventilation of the sleeping barracks, "but the freest ventilation did not "entirely check the spread of the disease." Much has been done towards improving the sanitation of both these jails, and further measures necessary to prevent the recurrence of this disease have now been recommended by the Inspector-General. There was not a single death from cholera in any of the jails of the province.

Burma.

The health of the prisoners in the Burma jails on the whole showed improvement. Among all classes of prisoners the admissions into hospital were in the ratio of 894 per 1,000 of average strength, against 934 in 1892, the daily sick-rate was 49 or 10 per 1,000 more, and the death-rate fell from 33·10 to 24·65. The increase in the daily sick-rate points to the nature of the sickness being of a more severe character. In 8 jails out of 30 there were no deaths, while in 15 the provincial rate was exceeded, the highest being 131·15 at Meiktila, 111·11 at Monywa, 74·07 at Ye-u, 61·22 at Kindat, and 50·85 at Pakokku, all of which are in Upper Burma. The jail at Meiktila continued to cause some anxiety. "At first," it is reported, "the diet was believed "to be in fault, but a similar diet is used at other jails and by the free population; "now it is supposed that the water, which is drawn from the lake, is so impure as to "cause disease." It is satisfactory to notice that the admission-rate at the Moulmein jail was comparatively low, and the death-rate only 16 per 1,000, as it was feared that it would be necessary to reduce its status owing to its unhealthiness. The chief causes of death were dysentery and diarrhœa, tubercle of the lungs, and respiratory diseases. From cholera there were 31 cases and 18 deaths, compared with 183 cases and 104 deaths in 1892. Of the total 290 deaths 268 occurred amongst convicts, representing 23·57 per 1,000 of their average strength. The accommodation for the prisoners during the year was on the whole ample, though owing to occasional local pressure there was over-crowding at several jails at one time or another.

Assam.

There was a satisfactory improvement in the health of the prison population of Assam as compared with 1892, the returns of 1893 showing an admission-rate of 1,414 per 1,000 of average strength against 1,913, a daily sick-rate of 47 against 55, and a death-rate of 46·99 against 58·97. The death-rate would have been considerably lower but for the high mortality at the Tezpur jail, in which 25 deaths occurred among an average population of 204, the death-rate being 122 per 1,000 against 48 in 1892. Excluding the figures for this jail the provincial death-rate among prisoners of all classes would be reduced to 33 per 1,000. The high death-rate at the Tezpur jail was attributed by the Superintendent and the Sanitary Commissioner of the province to unnecessary transfers from other jails of prisoners in bad or indifferent health. But the Chief Commissioner, after carefully examining the particulars of the 25 deaths, was unable fully to accept this view, and he trusted that the high mortality was only accidental. All the other jails and lock-ups showed a considerable decrease in the number of deaths as compared with the number reported in 1892. The decrease was most marked in the Sylhet jail, the largest in the province, where with an average daily strength of 369 the mortality ratio fell from 69·29 in 1892 to 27·11 in 1893. Of the total 62 deaths 25 were from dysentery and diarrhœa, 14 of which occurred at the Tezpur jail. From cholera there were five deaths; of these the Silchar and Sylhet jails returned two each, and Gauhati jail one. Among the convict class there were 56 deaths, representing 46·71 per 1,000 of average strength, against 73 or 61·46 in 1892. On the whole the accommodation was sufficient for all classes of prisoners, though at times there was over-crowding in some jails for short periods, which was remedied by transfer to other jails and by temporary use of wards usually occupied by prisoners of other classes.

Central Provinces.

The vital statistics of the jails of the Central Provinces for 1893 are very satisfactory. The admissions to hospital per 1,000 of strength fell from 945 in 1892 to 803, the daily sick-rate from 31 to 28, and the death-rate from 44·66 to 19·01. The total deaths decreased from 212 to 84, which was partly accounted for by the absence of cholera, only one death having taken place against 46 in the previous year, and to the great fall in mortality at the Sambalpur and Bilaspur jails from 309·4 and 222·7 per 1,000 respectively to 35·5 and 50·5. The death-rate in the Jubbulpore central jail, once noted for its exceptionally high mortality, fell in the year under review to the low figure of 9·6 per 1,000 of its average strength of 1,196. "There "can be little doubt," the Chief Commissioner remarks, "that this is mainly due to "the efficient system of sub-soil drainage in existence in this jail, and coupled with "the improvement in health noticeable in Saugor and Sambalpur, justifies the "extension of sub-soil drainage to other jails such as Nagpur, where similar conditions "prevail." All the 84 deaths but two occurred amongst convicts, the rate per 1,000 of average strength being 19·57 against 45·5 in 1892. It was thought probable that the health of the prisoners throughout the year was favourably affected by the reduction in the number of the jail population with consequent less overcrowding. Extra accommodation for male convicts was made during the year by the construction

of a new hospital at Jubbulpore, and the conversion of the old hospital into a ward for juveniles, and in order to still further increase the accommodation sanction had been accorded to enclosing one of the new hospital buildings, and completely segregating the females by transferring them to it, and to make over their present barrack for male convicts.

Madras. The health of the Madras jails also showed a great improvement compared with the previous year. The hospital admission rate fell from 724 per 1,000 of average strength in 1892 to 510 in 1893, the daily average sick-rate (22) was 3 per 1,000 less, and the death-rate declined from 45·14 to 23·19. This great improvement was due in a large measure to the absence of cholera, which attacked only one jail (Trichinopoly) in an epidemic form during the year, and caused 23 deaths as compared with 192 in 1892. But even after deducting cholera deaths, the rate of mortality in 1893 compares favourably with that of the preceding six years, "and this result," the Inspector-General reports, "must be mainly attributed to the care and attention of medical officers, and in those "jails where the superintendent is not the medical officer, to the steady supervision of "superintendents in all matters connected with the health of the jail." In three jails there were no deaths, and in six the average rate of mortality was exceeded, the highest being 76·65 at Cannanore, followed by 59·18 at Cuddapah and 30·15 at Trichinopoly. These three jails have had a bad record of mortality for some years. In the course of the last eight years the death-rate has exceeded 40 per 1,000 on five occasions at Trichinopoly, on six occasions at Cannanore, and on four occasions at Cuddapah. Of the 61 deaths at Cannanore and of the 12 at Cuddapah, 43 and 10 respectively occurred among prisoners who had been in confinement for less than six months. The Madras Government has required a special report regarding the Cannanore jail, and also regarding the Cuddapah jail if its condition does not improve. Several jails which are usually exceedingly unhealthy showed a low rate of mortality in 1893. Conspicuous among these were Berhampore, Parvatipuram, and Mangalore. Out of 224 deaths in the 21 district and central jails, 65 were from dysentery and diarrhœa, 32 from anæmia, the same number from respiratory diseases, and 23 from cholera. Among convicts only the death-rate was 24·54 per 1,000 of average strength. On the whole the accommodation for prisoners was sufficient, but some few jails were overcrowded during part of the year, and accommodation for the surplus population was found in work-sheds and other buildings, and relief was given by transfers. At the close of the year Parvatipuram, Salem, and Bellary jails were undergoing extension. The provision of a new jail at Cuddalore has been sanctioned, but the plans and estimates were still before the Government.

Bombay. In the Bombay Presidency the health of the prison population was generally satisfactory. The rate of admissions into hospital among all classes of prisoners rose from 787 per 1,000 of average strength in 1892 to 808, the daily sick-rate remained the same, 29, and the death-rate fell from 36·52 to 25·44. Owing to exceptional circumstances there was more overcrowding than in 1892, but the Local Government are satisfied that measures were taken to relieve it without delay. The most satisfactory feature of the vital statistics was the diminution in the death-rate at the Shikarpur jail from 121·6 per 1,000 in 1892 to 32·5. The most unhealthy jail in the Presidency in the year under notice was Kaira, which recorded a death-rate of 123·1 against 70·4 in 1892. This jail, however, was to be closed on the completion and opening of the Ahmedabad central jail. The only other jail in which the mortality was excessive was Surat, where the death-rate rose from 38·7 in 1892 to 65·2 in 1893. Including subordinate jails there were 207 deaths, and of these 186 occurred amongst convicts, representing a ratio of 25·8 per 1,000 of average strength against 36·5 in 1892. More than a third of the deaths were due to respiratory diseases; dysentery and diarrhœa yielded about a fifth, and cholera a ninth. Of the 23 cholera deaths 21 occurred among convicts. Kaira returned 9, Surat 5, Dhulia 4, Bombay 2, and Thana 1; the remaining two deaths took place among under-trials in the lock-ups. The disease was of a malignant type, as shown by the fact that no less than 77 per cent. of the cases proved fatal. Nearly a half of the total deaths occurred among convicts who had been less than six months in jail.

Berar. The health of the prison population in Berar during 1893 was not so good as usual. The rate of admissions into hospital per 1,000 of average strength rose from 575 to 860; the daily sick-rate increased from 16 to 27, and the death-rate from 17·16 to 28·0. Of the total 38 deaths just a half occurred at Akola, where there was a

serious outbreak of scurvy and influenza, the latter being mainly answerable for the increased mortality. The death-rate of this jail was 33·4, the highest in the province, against 29·6 in 1892. Cholera, though prevailing to a certain extent among the free population, did not visit any of the jails, while respiratory diseases alone yielded 50 per cent. of the total mortality. There was overcrowding in most of the jails during the year, but only in Akola was it at all serious. At this jail "the barracks," it is stated, "were unavoidably crowded during a part of the year, and this state "of things probably predisposed prisoners to the attacks of the serious forms of illness "which prevailed in the latter part of the year." Proposals for improving the jail at Akola were under consideration, as was also the question of providing a central jail for the province at Amraoti.

V.—VACCINATION.

General results.

During 1893–94 there were 6,716,134 persons successfully vaccinated in the several provinces of India, being an increase of 319,654 on the number of the previous year. According to age, over 2½ millions of the total were children under one year of age, and about 3 millions were children between the ages of one and six years. The proportion of population protected against small-pox by the year's operations ranged from 60·15 in Coorg to 25·46 in the North-Western Provinces. In the vaccination of infants the best results were, as usual, obtained in Berar, where 61·0 per cent. of the children born during the year (estimated at 40 per 1,000 of population) were protected. Bombay Presidency came next with a percentage of 55·2, followed by the Central Provinces with 50·9, and the Punjab with 49·4. Of the remaining provinces, only in the North-Western Provinces and Oudh did the successful cases among infants equal 20 per cent. of the estimated births.

Statement showing the total number of persons successfully vaccinated during the year 1893–94:—

Province.	Population among whom Vaccination was carried on (Census of 1891).	Number of Persons successfully vaccinated.	Ratio of successful Vaccinations per 1,000 of Population.	Number of Children successfully vaccinated.		Percentage of Children born during the Year (calculated at 40 per 1,000 of Population) successfully vaccinated.
				Under One Year of Age.	Between One and Six Years of Age.	
Bengal - - -	70,492,880	1,817,022	25·83	363,959	1,256,155	12·9
North-Western Provinces and Oudh.	47,146,327	1,199,590	25·46	522,658	563,429	27·7
Punjab - - -	20,553,982	776,229	37·76	406,244	133,019	49·4
Central Provinces - -	12,177,841	428,117	35·15	247,857	115,784	50·9
Berar - - -	2,897,040	101,298	34·96	70,681	20,370	61·0
Burma - - -	8,132,988	229,059	28·16	49,636	110,656	15·2
Assam - - -	5,634,258	167,668	29·75	37,112	87,519	16·5
Madras Presidency - -	35,830,282	1,099,553	30·68	241,927	558,708	16·9
Bombay Presidency - -	29,374,621	887,212	30·19	648,572	187,816	55·2
Coorg - - -	173,055	10,386	60·15	1,102	3,846	15·9
Total - - -	232,413,274	6,716,134	28·89	2,589,748	3,037,302	27·8

Bengal.

The total number of vaccinations performed in Bengal during 1893–94 was 1,844,304, of which 1,817,022 were successful, against corresponding figures in 1891–92 of 1,836,411 and 1,812,259. The primary operations numbered 1,829,416, of which 99·20 were successful. According to age, 363,959 of the successful primary vaccinations were of children under one year of age, and 1,256,155 were between one and six years. For the whole province the successful vaccinations were in the proportion of 25·83 per 1,000 of the population. Estimating the births during the year at 40 per 1,000, the percentage of infants successfully vaccinated was only 12·9, a ratio far below that attained in other provinces. The plan of vaccinating direct from calves in the villages, suggested by Dr. Dyson, was introduced, but too late to admit of a full trial. The experiment was to be continued during the ensuing season with all the precautions needed to give it a fair chance of success. A series of interesting experiments in vaccination from the kid was also made by Dr. Moir, and the results showed that children can be successfully vaccinated with lymph so obtained, but inoculation from kid to kid was not attended with success. Instructions had been given Dr. Moir to continue the experiments with the view of ascertaining whether such inoculation is possible. The attitude of the people towards vaccination is still described as one of passive acceptance with very strong objections to pay for the operation. In the opinion of the Sanitary Commissioner the only solution of the difficulty is either to extend the provisions of the Compulsory Vaccination Act throughout rural areas, or to make vaccination free. The Lieutenant-Governor, however, points out that compulsory vaccination does not exist in other provinces to a large extent, and they have nevertheless been more successful than Bengal. He thinks it is more probable that the fact to be explained is due to distrust in vaccination

as a prophylactic, and he trusted that the Sanitary Commissioner would endeavour to discover the causes of the distrust felt, and, so far as the distrust is justified, to remedy and remove them by insisting that the lymph used by vaccinators is really what it ought to be.

North-Western Provinces and Oudh.

Vaccination continued to make substantial progress in the North-Western Provinces and Oudh during 1893–94. The total number of persons vaccinated rose from 1,112,117 to 1,365,373, and the successfully vaccinated from 959,128 to 1,199,590. The proportion of persons protected by vaccination is, however, still very small, the ratio for the year being only 25·46 per 1,000, which is the smallest ratio attained in any province in India. Primary vaccinations numbered 1,339,711, of which 93·13 per cent. were successful, showing a slight increase on 92·43, the percentage of success in the previous year. Of the 1,181,600 successful primary cases, 522,658 were infants and 563,429 were children over one and under six years of age, both figures showing a satisfactory improvement as compared with the numbers of the previous year, which were 424,016 and 452,993 respectively. Estimating the births at 40 per 1,000 of the population, 27·7 per cent. were successfully vaccinated during the year.

In the first circle, where vaccination for years past has been more fully established than elsewhere in the province, the average ratio of success of its 13 districts equalled 30·0 per 1,000 of the population, against a mean for five previous years of 25·0. In the second circle, including the Rohilkhand and Oudh divisions, the ratio was 27·6, against a five years' mean of 14·5. The progress was more marked in Oudh than in Rohilkhand, as in Oudh so much more way had to be made up to bring the figures to a level with even backward districts in the adjoining province. The ratio of the third circle (20·3), shows that there is much room for improvement, although it was 3·4 per 1,000 higher than the average for the previous five years. The Vaccination Act was in force during the year in 86 out of the 103 municipalities, and since the close of the year it has been brought into force in all but five. The ratio of successful primary vaccinations on the municipal population was 40·4 per 1,000, which is estimated as being the birth-rate of the year. With the exception of Oudh and the eastern districts, the feeling of the people with regard to vaccination is said to have changed from dislike and dread to acquiescence and to positive approval. Regarding the progress in vaccination, Dr. Hutcheson says:—"The vigour with which operations have been carried on for the past few years "in the United Provinces has been very marked, and the results of the year's "operations, in view of the opposition and prejudice which still exists, are very "satisfactory. The advance made has been more than considerable; and if the good "work done in many districts were achieved in all, protection against small-pox in "the United Provinces would soon extend to nearly every child, as it does in some "areas in the first circle. Vaccination in the United Provinces to be complete "implies the successful vaccination of at least 1,330,000 children annually, and "against that number, 1,181,000 successful vaccinations were recorded during the past "season. A little more effort and exactness in system and method by district "superintendents, aided as hitherto by district authorities, and the work will soon be "fully accomplished."

Punjab.

Vaccination continued to be satisfactorily carried on in the Punjab. Altogether there were 1,056,805 operations performed during 1893–94, showing an increase of 230,324 cases as compared with the results of the previous year. Of the 585,162 primary cases, 94·30 per cent. were successful. Notwithstanding that there was an increase of over two hundred thousand operations, the number of successful cases among children under one year of age fell from 415,576 or 50·5 per cent. of the births calculated at 40 per 1,000 of population, to 406,244 or 49·4 per cent. The decrease is the more to be regretted as it was distributed over no less than 17 out of the 31 districts in the province. The provincial ratio of persons successfully vaccinated per 1,000 of the total population was 37·76, against 33·25 in the previous year. An increased number of operations was performed with animal lymph, and it is reported that the use of it has become almost universal in the province. The efficacy of a donkey foal as a vaccinifer was under consideration. The Compulsory Vaccination Act was introduced during the year into five municipalities and three cantonments, and rules were under consideration for three more municipalities.

Burma.

The total number of persons vaccinated in Lower Burma during 1893–94 was 177,356, as compared with 156,946 in the previous year. The increase of 20,410 was spread over all the districts except Akyab, where the number of vaccinations fell from 18,761 in 1892–93 to 2,290. This great decrease was ascribed chiefly to the

prevalence of a severe epidemic of small-pox during the first five months of the year, to the failure of lymph, and to the prohibition of the work of private vaccinators, which led to a revival of inoculation. Every effort was being made to prevent a recurrence of this most unsatisfactory state of affairs, and an improvement in the returns of 1894–95 was expected. The percentage of success in primary operations continued to improve. Out of 136,912 primary cases, 90·27 per cent. were successful, against a corresponding ratio of 86·65 in the previous year. In March 1893 the Vaccination Act was extended to Pegu, but popular opposition to vaccination remained unabated, as is shown by the small proportion of children protected to children born, the percentage of estimated births successfully vaccinated being only 13·4. The extension of the Act to rural tracts and towns (other than municipalities) was under consideration.

In Upper Burma 101,420 vaccinations were performed during 1893–94, being an increase of 21,265 on the number of the previous year. All districts contributed to the increase except Mandalay, Meiktila, Myitkyina, and Monywa. In Mandalay the decrease of 3,100 was attributed to the resentment of the vaccinators against the appointment in June of a local assistant superintendent of vaccination, and coercive measures had to be adopted to overcome their obstruction. The percentage of success in primary vaccinations was 86·35, nearly the same as in 1892–93. Estimating the births at 40 per 1,000 of population only 17·7 per cent. were successfully vaccinated, which, however, is an increase of 1½ per cent. on the ratio of the previous year. The Vaccination Act was extended in 1893–94 to the municipalities of Monywa and Ye-u, and it has since been extended to others. In the province of Burma as a whole the ratio of successful vaccinations per 1,000 of population was 28·16, as compared with 23·32 in the previous year, and the percentage of infants successfully vaccinated, estimating the births at 40 per 1,000 of population, was 15·2.

Central Provinces.

In the Central Provinces there were 459,559 persons vaccinated during 1893–94, which is an increase of 5,713 on the number of the previous year. The increase, however, occurred entirely in re-vaccinations, as the primary vaccinations fell from 410,891 to 397,082. The percentage of success in primary cases also declined from 96·68 to 95·48; and the proportion of the total population protected by vaccination was 35·15, as compared with 34·25 in 1892–93. Of the 18 districts in the province only six showed an increase in primary operations, and 12 a decrease. "Vaccination "from the buffalo calf," the Chief Commissioner observes, "is now established in "the province, and the successful substitution of this method for arm-to-arm "vaccination, and the use of calf lymph, may be trusted in time to remove much "of the popular objection to vaccination based on social and religious prejudices. "The adoption of the Vaccination Act by municipal committees, who for long were "consistently opposed to vaccination, is perhaps a proof of this." During the year under notice the Act was extended to 10 municipalities, bringing the total up to 17; while up to September 1892 Raipur was the only one in the province that had adopted the Act. The Sanitary Commissioner testifies to the efficiency of the supervision of vaccination by civil surgeons in the province. "Considering the mortality five "years ago from small-pox," he says, "which destroyed nearly 17,000 people in the "12 months, the small number of deaths during the year under report (1,602) is "a fair test of the efficiency both of vaccination and of the working in these "provinces."

Assam.

The results of vaccination work in Assam for 1893–94 compare unfavourably with those for the previous year. There were 206,172 operations performed by all agencies in the province against 224,943 in 1892–93. There was a large increase (6,276) in the Naga Hills, Sylhet (2,538), and Manipur (1,776) and a slight increase in Lakhimpur and in the Khasi and Jaintia Hills, but in all the other districts there were fewer vaccinations done than in the previous year. Of the total operations 200,997 were primary cases, and of these only 85·1 per cent. were successful. The unfavourable results of the year were due chiefly to the failure of the lymph supplied from the Shillong depôt at the beginning of the season, in consequence of which nearly a third of the vaccination season was lost. The people took advantage of this unfortunate failure by refusing to have their children operated on a second time. The quality of the lymph supplied later was, however, reported to be excellent, and steps have been taken to avoid a recurrence of similar failures in future. The number of infants successfully vaccinated was 37,112, representing only 16·5 per cent. of the births, estimated at 40 per 1,000 of the population. It is satisfactory to notice

that within the area in which Compulsory Vaccination Acts were in force, containing a population of 62,127, not a single death from small-pox occurred during the year.

Madras. The aggregate number of vaccinations performed in the Madras Presidency during 1893–94 was 1,178,832, being an increase of 14,291 on the operations of the previous year. The increase, however, was entirely under re-vaccinations, as the primary cases fell from 1,106,517 to 1,105,408. But there was an improvement in the quality of the work done, 96·2 per cent. of the primary vaccinations being successful, against 94·8 in 1892–93. Infantile vaccination exhibited a decrease, the number of children under one year of age successfully vaccinated having fallen from 259,459 to 241,927, which represented only 16·9 per cent. of the estimated births. Vaccination was compulsory in all municipalities for the first time, notwithstanding there was a decline in the number of operations performed by municipal vaccinators from 114,953 to 113,837. In no less than 29 towns was there a retrogression. In the town of Madras there was a decline in the number of operations performed from 24,858 to 23,644. Of the 21 districts there was a decrease of work in nine, the most marked case being that of Kurnool; the remaining 12 districts showed an improvement. Animal vaccine was employed both in districts and municipalities, and the total number of vaccinations performed with it was 1,077,580, or only 101,252 less than the total number of operations, and of these 1,007,334, or 93·4 per cent. were successful, the corresponding figures for the previous year being 884,525, 832,021, and 94·1. The best results were obtained from calf-to-arm vaccination, with a percentage of success of 97·0.

Bombay. The out-turn of vaccination work in the Bombay Presidency for 1893–94 compares unfavourably with that of the previous year. The number of operations performed showed a decline of 12,347, the total being 974,411 against 986,758. The decrease was entirely under primary vaccinations, which fell from 924,165 to 905,870; the percentages of success being respectively 93·82 and 94·56. The Sanitary Commissioner states that the progress of vaccination is retarded by the opposition among the people of large towns, who know that they are not legally bound to submit to the operation, and who refuse to give lymph in arm-to-arm work. And he adds that the delay in making the Compulsory Act operative is much felt in towns. The Government of India point out that such opposition is common to every province in India, but that the difficulty concerning lymph is met elsewhere by the introduction of the use of animal lymph, without resorting to compulsory vaccination. The substitution of animal for human lymph continued to increase in the larger towns of the Presidency, and nine municipalities had voted the sums necessary to provide a calf the whole or part of the year. Of the 852,706 primary successful cases, 648,572, or 76 per cent. were infants under one year of age, and reckoning the births at 40 per 1,000 of population, 55 per cent. were protected from small-pox. Inoculation was not practised anywhere in the Presidency during the year.

Berar. There was a slight fall in the out-turn of vaccination work in Berar during 1893–94, as compared with that of the previous year, the total operations having decreased from 145,882 to 137,152. This was attributed to a very sickly season, which affected both the vaccination staff and the people generally. Nevertheless vaccination work in the province is very satisfactory, and, in the opinion of the Sanitary Commissioner, has reached that point "when fluctuations in the number of primary operations will mainly "depend upon healthy and prosperous seasons or the reverse, as affecting the fecundity "and well-being of the people." The number of primary vaccinations was 97,786, out of which 95·1 per cent. were successful, against a rate of success of 94·7 in 1892–93. Of the total number of successful primary operations, 70,681 were performed on infants under one year of age; estimating the births at 40 per 1,000 of population, 61 per cent. were protected from small-pox. As proof of the efficacy of vaccination in checking small-pox mortality in Berar, the Sanitary Commissioner furnishes a statement showing that while the ratio of successful vaccinations per 1,000 of population has risen from 8·92, the mean of five years 1868–69 to 1872–73 to 35·8, the mean of five years ending 1892–93, the mortality from small-pox for the same periods has declined from 2·02 to 0·2 per 1,000. The corresponding ratios for 1893–94 were 35·0 and 0·06 per 1,000 respectively.

VI.—MEDICAL INSTITUTIONS.

Civil Hospitals and Dispensaries.

The following comparative statement shows the number of hospitals and dispensaries open in the several provinces of India during 1893 and the previous year, and the number of patients under treatment:—

Provinces, &c.		Number of Institutions.	Number of In-door Patients.	Number of Out-door Patients.	Total Number of Patients.
Bengal	1893	339	40,589	1,885,939	1,926,528
	1892	299	37,845	1,575,926	1,613,771
Calcutta and Howrah	1893	12	26,058	252,059	278,117
	1892	11	25,211	226,772	251,983
North-Western Provinces and Oudh	1893	328	56,650	3,621,185	3,677,835
	1892	315	56,226	3,376,125	3,432,351
Punjab	1893	242	54,905	3,061,918	3,116,823
	1892	230	53,425	2,937,314	2,990,739
Burma	1893	87	29,118	473,884	503,002
	1892	82	29,716	427,813	457,529
Central Provinces	1893	111	8,986	1,085,068	1,094,054
	1892	110	8,523	963,904	972,427
Assam	1893	92	5,314	429,319	434,633
	1892	81	5,734	364,098	369,832
Coorg	1893	7	1,160	27,299	28,459
	1892	5	1,292	25,752	27,044
Madras	1893	459	52,773	3,372,909	3,425,682
	1892	449	52,926	3,195,658	3,248,584
Bombay	1893	295	47,117	2,220,097	2,267,214
	1892	269	46,791	1,946,908	1,993,699
Berar	1893	44	4,298	318,767	323,065
	1892	42	3,858	292,233	296,091
Total	1893	2,016	326,968	16,748,444	17,075,412
	1892	1,893	321,547	15,332,503	15,654,050

Bengal.

The returns of the charitable dispensaries in Bengal for 1893 show a marked increase both in the number of institutions and in the number of patients under treatment in them. The total number of dispensaries at work during 1893 in Bengal, exclusive of Calcutta, was 339, an increase of 40 on the number of the previous year. At these there were 1,926,528 patients under treatment, 40,589 being in-door and 1,885,939 out-door patients, against 37,845 and 1,575,926 respectively in the previous year. This shows a total increase of 312,757, which was attributed partly to the opening of new dispensaries and partly to the increasing popularity of the institutions. In 14 dispensaries the increase in the number of patients attending each institution during the year was over 3,000. Considering, however, that each institution can only serve the people living within easy reach of it, it is satisfactory that so large a number as $2\frac{3}{4}$ per cent. of the population obtained gratuitous medical aid in 1893, which is a marked advance on previous years. There was a satisfactory increase in the number both of women and children, but the number of males was nearly four times that of females. The increase among females as compared with the previous year amounted to 49,777 or 19 per cent., the number having risen from 249,410 to 299,187. Although this represents but an infinitesimal fraction of the female population of the province, the advance is satisfactory, and it is expected that with the gradual increase in suitable accommodation provided by the construction of Dufferin hospitals throughout the province, the number of female applicants for medical help will increase. Malarial

fever, as usual, was the commonest form of illness under treatment, and the cases rose from 320,113 to 408,043, equal to 21 per cent. of the total number of patients. Cases of dysentery and diarrhœa also increased from 71,781 in 1892 to 87,243 in 1893, while the number of cholera patients declined from 9,795 to 8,077. Cases of venereal diseases rose from 42,734 to 50,995. Among the in-door patients there were 5,059 deaths, being in the ratio of 124·6 per 1,000 of total treated, against a death-rate of 134·9 per 1,000 in 1892. Great attention is paid in these institutions to surgery, and during the year 9,683 major operations were performed against 8,979 in 1892; including those remaining from the previous year the total number was 9,970, and of these 183 terminated fatally. Operations for cataract decreased from 2,333 to 2,221, and of these more than 79 per cent. proved successful. Though representing a large amount of surgical work, it compares, as the Inspector-General points out, unfavourably with that of the North-West Provinces and the Punjab. "The timid nature of the Bengali makes him "shrink from operative interference unless he has full knowledge of and full "faith in the operator, and it is only when a medical officer has established a reputa-"tion as a successful surgeon that cases flock to him. Many Civil Surgeons have "complained to me that they cannot get cases. The difficulty is a real one, but "confidence is increasing fast, and I have little doubt will continue to increase as the "people realise more fully that relief is possible."

The following statement shows the number of in-door and out-door patients treated in the several hospitals and dispensaries in Calcutta during 1893 and the previous year:—

Name of Institutions.	1892.				1893.			
	In-door Patients.	Out-door Patients.	Total Number of Patients.	Died per 1,000 of In-door Patients treated.	In-door Patients.	Out-door Patients.	Total Number of Patients.	Died per 1,000 of In-door Patients treated.
Medical College Hospital	7,054	54,660	61,714	114·1	7,025	54,091	61,116	113·8
Presidency General Hospital	3,498	—	3,498	34·3	3,063	—	3,063	43·7
Campbell Hospital	8,551	11,470	20,021	197·2	9,384	22,566	31,950	191·4
Police Hospital	2,045	—	2,045	9·7	2,406	—	2,406	10·3
Mayo Native Hospital	1,756	27,508	29,264	129·7	1,870	29,742	31,612	94·6
Chandney Hospital	421	44,947	45,368	23·7	433	44,355	44,788	32·3
Park Street Dispensary	—	28,847	28,847	—	—	29,149	29,149	—
Chitpore Dispensary	—	20,621	20,621	—	—	23,383	23,383	—
Sukea's Street Dispensary	—	18,485	18,485	—	—	19,390	19,390	—
Dufferin Victoria Hospital	—	—	—	—	155	8,758	8,913	38·7
Bhawanipur Dispensary	—	9,737	9,737	—	—	10,287	10,287	—
Total Calcutta Hospitals and Dispensaries	23,325	216,275	239,600	123·2	24,336	240,721	266,057	121·4
Howrah General Hospital	1,886	10,497	12,383	176·0	1,722	10,338	12,060	230·5
Grand Total	25,211	226,772	251,983	127·2	26,058	252,059	278,117	128·8

It will be seen that there was an increase of 25,287 in out-door patients and of 847 in in-door patients. The increase was attributed partly to the inclusion for the first time of the statistics of the Dufferin Victoria Hospital, and partly to the growing popularity of the out-door departments of the several institutions. The death-rate among the in-patients was 128·8 per 1,000 against 127·2 in 1892. Cholera patients declined from 709 to 431, and the fatal cases from 425 to 241. Small-pox cases rose from 35 to 49, most of which were treated in the Campbell Hospital. Dysentery and diarrhœa were considerably more prevalent, and the number of patients rose from 12,608 to 16,113. The number of cases of malarial fever also rose from 41,202 in 1892 to 49,080. The total number of in and out patients treated for venereal affections increased from 13,072 to 14,483. There were 3,339 important surgical operations performed against 3,403 in 1892, and of these death ensued in 110 cases against 134.

North-Western Provinces and Oudh.

During 1893 there were 14 new dispensaries opened in the North-Western Provinces and Oudh, bringing the total at the end of the year up to 328. The number of patients who received medical aid was 3,677,835 against 3,432,351 in the previous year. There was thus an increase in 1893 of 245,484 patients or 7·15 per cent. Of the total number 726,123 were women and 910,214 were children, both showing a marked increase on the figures of the previous year, which were 693,502 and 839,065 respectively. The in-door patients numbered 56,650, as compared with 56,226 in 1892, and among them there were 2,484 deaths, giving a death-rate of 43·8 per 1,000 against 3,094 or 53·0 in the previous year. Of the diseases for which the patients were treated 688,097 were suffering from malarial fevers, an increase of 20,530 on the number of 1892; of cases of cholera there were only 857 against 9,075, and

cases of diseases of the eye increased from 269,004 to 278,279. From venereal diseases there were 84,258 cases. The progress of surgical work kept pace with the general increase in the number of patients applying for relief. The number of surgical cases rose from 166,338 to 167,217. These included 27,206 major operations (with 1209 remaining from the previous year), of which 21,397 resulted in cure and 378 were fatal. The new dispensaries accounted for 74,549 of the total increase of patients, leaving 170,935, or nearly 5 per cent., to the credit of the growing popularity of the older dispensaries.

Punjab. Twelve more dispensaries were at work in the Punjab during 1893 than in the previous year, bringing the total number of these institutions up to 242. At these, 3,116,823 patients were under treatment, being an increase of 126,084 on the number of 1892. When it is remembered that the year 1893 was a healthy one, the increased attendance clearly indicates the growing popularity of these institutions. Calculated on the approximate population of the province, the number of patients yielded a percentage of 14·94. Of the diseases for which patients sought relief there were only 180 cases of cholera, being a decrease of 11,141 on 1892. Cases of malarial fever also fell from 700,784 to 545,835. Diseases of the eye showed an increase of 12,918 cases over 1892, the number treated in 1893 being 280,483. From venereal diseases there were 40,021 cases under treatment. Among the in-patients there were 2,471 deaths during the year, being in the ratio of 45·1 per 1,000 of the number treated against a death-rate of 60·1 in 1892. In surgical work there was an increase in minor operations from 186,702 to 201,357, and in those of a major kind from 14,660 to 19,335. Including those remaining from 1892, the latter numbered 19,676. Among these there were 5,444 cases of cataract, including 135 remaining under treatment from the previous year, of which 85·1 per cent. resulted in cure.

Burma. Two new dispensaries were established in Lower Burma during 1893, bringing the total up to 39. At these 318,682 patients attended, as compared with 298,846 in 1892. Indoor patients fell from 18,876 to 18,401, of whom 12,816 were cured and 1,343 or 73 per 1,000 died, against 1,420 deaths or 75 per 1,000, in the previous year. The total number of Burmans treated was 163,917, exceeding the number of 1892 by 11,603, and there was an improvement in the attendance of the other classes also. Malarial fevers alone were responsible for nearly one-fifth of the attendance, and next came cases of worms and eye diseases. The number of cholera patients fell from 415 to 124. Surgical work also showed an increase both in major and minor operations, the former having risen from 418 to 477, and the latter from 7,970 to 8,587. The number of patients cured, after being subject to major operations, was 386, and there were only 17 deaths, results which, it is said, reflect great credit on the medical officers concerned.

In Upper Burma 48 dispensaries were working during 1893, or three more than in the previous year. The total number of patients under treatment was 184,320, of whom 10,717 were in-patients, the corresponding figures for 1892 being 158,683 and 10,840 respectively. In the course of the year 8,431 patients were cured, 496 relieved, 146 discharged otherwise, and 423 died, the deaths yielding a ratio of 39 per 1,000, against 52 in 1892. The Burmese resort to these institutions in greater proportion in Upper than in Lower Burma, the percentage of Burmese to total treated being 51 for the lower part of the province against 61 in the upper part.

Central Provinces. There were 111 hospitals and dispensaries at work in the Central Provinces during 1893, or one more than in the previous year; and the total number of patients rose from 972,427 to 1,094,054. The increase extended to both in and out door patients, the former having risen from 8,523 to 8,986, and the latter from 963,904 to 1,085,068, "evidence, in a healthy year, of increased attention to the patients, and of their "increased confidence in the hospital officers." Among the in-patients there were 766 deaths or 85·2 per 1,000 of total treated, a lower rate by 12 per 1,000 than that of 1892. There were 24,932 surgical operations performed against 24,378 in 1892. Of these, 2,104 were major against 1,615. Malarial fever cases were much more numerous than in 1892, and in several other groups of diseases there was a considerable increase. Cholera cases fell from 1,908 to 53, and diarrhœa from 22,389 to 22,022, while dysentery cases rose from 15,480 to 15,633, but the largest increase took place in diseases of the skin and diseases of the eye, the cases being respectively 48 and 31 per cent. more than in 1892.

In the province of Assam there were 92 dispensaries open during 1893, at which 434,633 patients were under treatment against 369,832 in the previous year. The in-patients numbered 5,314, as compared with 5,734 in 1892, and of these 2,407 were cured, 368 relieved, 1,126 discharged otherwise, and 1,064 died, the latter representing 200·2 per 1,000 of the total in-patients, against a ratio of 202·3 in 1892. The decrease of 420 in the number of in-patients was attributed to the prejudice natives of Assam have against remaining in the dispensaries for in-door treatment; most of the inmates are foreigners and immigrants. It is hoped that this prejudice will die out as the benefits derived from the dispensaries come to be more widely felt. The number of indigenous in-patients fell from 1,641 in 1892 to 1,471 in 1893. Of the total number of persons who received medical aid, malarial fever, including kala-azar, accounted for 83,416 cases, or about a fifth of the total treated; skin diseases 97,489, worms 54,953, and diseases of the digestive system 23,206. Cholera patients numbered 3,989. Of surgical cases there were 10,580, including 876 major operations; of the latter, 732 resulted in cure and 32 were fatal. Assam.

Exclusive of the six hospitals in the Presidency town there were 453 dispensaries working in Madras at the close of 1893, or 10 more than in 1892. The results of the year were satisfactory, showing that 3,330,970 patients were under treatment as compared with 3,106,386 in 1892. There was thus an increase of 224,584, all being out-patients, as the in-door patients declined from 39,741 to 39,579. Of the latter 24,622 were returned as having recovered fully under treatment, 6,435 as relieved, and 4,138 as otherwise discharged. The deaths numbered 3,041 representing a ratio of 76·9 per 1,000 of the total in-patients against 93·5 in the previous year. The largest number of admissions was from ulcers, of which there were 369,261 cases, next came skin diseases with 363,047 cases, followed by diseases of the eye, from which there were 324,587 admissions. Satisfactory progress continued to be made in surgical work. The operations aggregated 118,314, including 5,567 of a major kind, of which latter 5,113 were cured and 168 terminated fatally. In 1892 the minor operations numbered 108,149, and the major 4,391. Madras.

In the six institutions of Madras town, which, as before, were wholly supported by the State, the number of sick treated increased from 89,272 in 1892 to 94,712 in 1893. Of the increase of 5,440 only 9 were in-patients, the total of this class being 13,194 against 13,185 in 1892. Amongst them 6,709 cases were recorded to have been cured or perfectly recovered, 2,697 were relieved, 2,311 discharged otherwise, and 684 or 51·8 per 1,000 died, against a rate of mortality in 1892 of 61·9. Of the several diseases for which the patients were treated, affections of the eye contributed 10,058 admissions or 10·6 per cent. of the total treated, next came malarious fever with 5,623 cases. From cholera there were only 10 cases, from dysentery and diarrhœa 3,802, and from venereal diseases 2,967, all being below the numbers recorded in the previous year. The surgical work performed during the year showed a falling off, the minor operations having decreased from 8,570 in 1892 to 8,121, and the major operations from 3,498 to 3,417. The results of the latter showed that 2,410 cases were cured, 599 relieved, and 110 died.

At the Madras Voluntary Venereal Hospital, which is included in the above six provincial hospitals in the city, there were 651 patients treated during 1893 as compared with 577 in the previous year. These figures may be considered satisfactory as showing that the number seeking relief is steadily increasing. The Superintendent reports: "Many of the cases presented themselves in a shocking state, being weakened "by exposure, disease, and bad food. The character of the syphilitic cases continues "to be of the very worst type. Mere children (one aged about 10) and old women "coming under observation. . . . Many of these unfortunate women insist on "leaving hospital before a proper cure is carried out, and I have no power to prevent "them, and so a very bad form of disease is spread broadcast."

Excluding the 11 medical institutions in the city of Bombay, there were 284 hospitals and dispensaries working in the Presidency during 1893. At these 2,160,898 patients were under treatment, of whom 28,489 were in-door and 2,132,409 out-door patients, against 28,372 and 1,851,955 respectively in 1892. As usual the largest number of cases were from malarious fever, viz., 434,113 or 20·1 per cent. of the total treated, next came skin diseases with a percentage of 12·2, followed by worms 10·6, and diseases of the eye 10·2. Cholera contributed 3,692 cases or 1,429 less than in 1892, and dysentery 28,726 or 3,447 less; on the other hand, cases of venereal diseases increased from 29,857 to 31,911. Of the in-door patients 20,890 were cured, 2,414 relieved, 2,339 discharged otherwise, and 1,543 died, the ratio of deaths to total Bombay.

treated being 54 per 1,000, a diminution of 9 per 1,000 on the ratio of the preceding year. Both major and minor operations were more numerous than in 1892. Apart from the 128 cases which remained under treatment from the previous year, 4,525 major operations were performed during 1893, giving a total of 4,653 or 734 more than in 1892. Of these 3,955 were cured, 266 relieved, and 118 proved fatal. The total number of minor operations was 92,078 as compared with 85,494 in 1892.

The total number of patients treated at the 11 civil medical institutions working in the town of Bombay during 1893 showed a falling off of 7,056, the figures being 106,316 against 113,372 in the previous year. The decrease occurred among out-patients of whom there were 87,688 as compared with 94,953 in 1892. The in-patients increased in number from 18,419 to 18,628, and of these 11,140 were cured, 4,073 relieved, 908 otherwise discharged, and 1,512 died, the deaths being in the ratio of 81 per 1,000 of the in-patients against 84 per 1,000 in 1892. As usual malarial fevers gave the largest number of admissions, namely, 13,172 or 12·4 per cent. of the total treated, compared with 14,579 or 12·9 in 1892, and venereal diseases contributed 5,564 cases or 5·2 per cent. against 5,428 or 4·8. From cholera there were only nine cases under treatment, just half the number of the previous year, and those of dysentery and diarrhœa declined from 1,627 and 3,345 respectively to 1,402 and 2,781. Including 32 cases which had been operated on in the previous year, the total of major operations was 2,507, and of these 2,309 were cured, 31 relieved, 19 discharged otherwise, and 96 died. The minor operations numbered 33,299 as compared with 24,019 in 1892.

Berar. Two new dispensaries having been opened in Berar in 1893 the number of medical institutions rose to 44. Of these eight are hospitals wholly maintained by the State. The total number of patients under treatment was 323,065 against 296,091 in 1892. Of these 4,298 were in-patients, of whom 3,669 were cured, and 171 died, which gives a death-rate of 39·7 per 1,000 as compared with a mortality of 151, or 39·1 per 1,000 in 1892. Malarial fevers continued to head the list of diseases from which relief was sought, and showed a marked increase of cases over the preceding year; nearly a fifth of the total patients were treated under this head; diseases of the eye and skin came next in order. Cholera cases declined from 1,148 in 1892 to 317; there was also a smaller number of admissions from bowel affections. Considerable progress was made in surgical work, and the number of major operations performed increased from 397 in 1892 to 630 in 1893, and of minor operations from 10,890 to 12,212.

Lunatic Asylums.

Bengal. At the five asylums in Bengal (viz., Dullunda, Dacca, Patna, Cuttack, and Berhampore) 1,156 lunatics, including 205 fresh admissions and re-admissions, were under treatment in 1893, being a decrease of 7 on the number of the previous year. In the course of the year under notice 92 patients were discharged as cured, and 71 as improved or otherwise, and 77 died. Compared with the figures of 1892, the admissions were greater by 19, and the discharges and deaths together by 42. At the end of the year there were 916 persons still under detention, or 35 less than at the close of 1892. The health of the inmates of the asylum showed an improvement on the previous year, the average daily number in hospital being 49 against 54 in 1892. There was, however, a small increase in the number of admissions into hospital owing, it is said, to the treatment of a larger number of trifling cases. The death-rate per 1,000 of average strength fell from 87·4 to 82·6. There were no very great variations of mortality in the hospitals, the minimum death-rate being 70·4 and the maximum 98 per 1,000. In the Cuttack asylum there were no deaths. The Inspector-General quotes figures showing that the rate of mortality of the Bengal asylums compares favourably with that of European asylums or with the other provinces of India, and the Lieutenant-Governor concurs in his opinion that the results "afford good evidence of the excellent hygienic "condition under which the lunatics live and of the care which is taken of them." The experiment of establishing dairy farms at lunatic asylums was further continued during the year. As a commercial enterprise it had not generally proved successful, but since the plan ensured a plentiful supply of good milk to the inmates it was to have a further trial so long as it paid its way.

In the Bhowanipur Asylum, containing European and Eurasian patients only, the population during 1893 was 64, or 3 more than in the previous year. Of this number 35 were under detention at the beginning of the year, and 29 were subsequently admitted, including two criminal lunatics. In the course of the year nine patients were discharged cured, two were despatched to Europe under the Merchant Shipping Act, six were transferred to the care of friends, one was deported to Europe as still insane, one was discharged otherwise, and four died, leaving 41 under detention at the close of the year. The health of the patients was exceedingly good throughout the year, there were only eight admissions to hospital and all the four deaths were due to causes connected with the insane condition of the patients.

North-Western Provinces and Oudh.

The population of the four lunatic asylums (Agra, Bareilly, Benares, and Lucknow) in the North-Western Provinces and Oudh in 1893 was 1,257, including 271 admissions during the year, against 1,291 in 1892. Before the close of the year 161 patients were discharged, of whom 119 were reported as cured, and 42 were made over to friends, and 52 died, leaving 1,044 under treatment at the end of the year. The year was exceptionally healthy, and the death-rate per 1,000 of average strength fell from 93 to 52. The number of men for whom employment was found in the asylums during the year slightly increased. But the advantages of moderate and regular employment for the inmates of asylums have been so often insisted upon by the Government that the results were looked upon as disappointing. The most suitable occupations appear to be gardening and the making of ropes and blankets. Dairy farming has been very successful at Bareilly; but it is a question whether it does not interfere with the regular duties of the staff.

Punjab.

The total number of lunatics in the Lahore and Delhi lunatic asylums in the Punjab during 1893 was 463, including 122 fresh admissions, against 472 in 1892. At the end of the year the number was reduced to 335 by the discharge of 96 patients (76 as cured, 16 made over to friends, and 4 otherwise discharged), and 32 deaths. The year being a very healthy one, the admissions into hospitals and deaths were considerably less in both asylums than in 1892. The cases in hospital numbered 512, or 254 less, the decrease was especially noticeable in Lahore, where the patients declined in number from 639 in 1892 to 432, and the deaths fell from 52 or 210·2 per 1,000 of daily average strength to 22 or 88·8; 14 of the 22 deaths occurred after the middle of November. Pneumonia was the chief cause of mortality in this asylum and accounted for nine deaths. In the Delhi Asylum there were 10 deaths or 99·3 per 1,000, against 15 or 156·1 in 1892. Both asylums were entirely free from cholera in 1893, whereas in the previous year there were 13 deaths from the disease, 12 of which took place in the Lahore Asylum.

Burma.

The Rangoon Asylum is the only one in the province of Burma. The accommodation it provides being inadequate, a number of lunatics was confined and treated in the Rangoon central jail. The asylum was, however, being extended with a view to provide adequately for the accommodation of lunatics from all parts of the province. During 1893 there were 334 patients in the Rangoon Asylum, including 69 fresh admissions, and the total was reduced at the close of the year to 253 by the discharge of 38 patients for different causes and the death of 43. The health of the lunatics was not at all satisfactory, the admissions to hospital having been more numerous than in any previous year, and the deaths rose from 27 or 102·0 per 1,000 of average strength to 43 or 168·8, which is the highest mortality on record in the asylum. Although considerable attention was devoted to this mortality, its causes remained obscure. "It is noteworthy," the Government observe, "that only seven of "the deceased lunatics had been over five years in the asylum, and there is no reason "to believe that any defect in the sanitary condition of the asylum caused the high "mortality."

Central Provinces.

In the two asylums of the Central Provinces (Nagpur and Jubbulpore) there were 357 lunatics under treatment during 1893, and of these 78 were fresh admissions. In the course of the year 35 patients were discharged as cured or otherwise, and 18 died, leaving 304 still under treatment at the commencement of 1894. The admissions to hospital at Nagpur in 1893 numbered 53 against 97 in 1892, and at Jubbulpore 94 against 86. There were no cases of cholera. The chief cause of sickness at both asylums was, as usual, malarial fever, which gave 13 admissions at Nagpur in 1893 against 53 in the previous year, and at Jubbulpore the number (27) was the same in both years. There was no overcrowding in either institution. There was increased mortality at both asylums as compared with the previous year. Of the 18 deaths, Nagpur recorded 7, being in the ratio of 47·7 per 1,000

of average strength against 3 or 22·9 in 1892. At Jubbulpore the deaths rose from 8 or 57·2 per 1,000 to 11 or 73·1. It is noticed that, in point of healthiness of the inmates and of the proportion of deaths to strength, the Central Provinces asylums compare very favourably with those in other provinces.

Assam. There is only one lunatic asylum in the province of Assam. This is situated in Tezpur, and the building is reported to be at present large enough for all demands on it. The total number of lunatics under treatment in the asylum during 1893 was 145, being a decrease of 11 on the number of the previous year. Of these 35 were fresh admissions. At the close of the year the population of the asylum was reduced to 98, 30 of the total number having been discharged, 15 died, and two escaped. The health of the inmates during the year was not satisfactory. Although the daily average sick rate, 74·0 per 1,000, was somewhat below that of the preceding three years, the ratio of admissions to hospital per 1,000 of average strength increased from 435 to 577, and the death-rate from 44·4 per 1,000 to 146·6. Of the 15 deaths, dysentery claimed 3, diarrhœa 1, lung affections 3, and anæmia 3. It appears, however, that the 15 deaths do not represent the real mortality, for it is said to have been the practice in some cases to send sick inmates to the charitable dispensary for treatment, and to exclude from the asylum those who died there. In the year under notice 11 lunatics were sent to the dispensary, of whom 10 died. This practice has since been discontinued by order of the Chief Commissioner of Assam.

Madras. At the commencement of 1893 there were 552 patients under treatment in the three lunatic asylums (Madras, Calicut, and Waltair) of the Madras Presidency. During the year 211 fresh cases were admitted, bringing the total population up to 763, or 74 less than the number in the preceding year. In the course of 1893 there were 113 cases of discharge, and of these 66 were cured. The results of the year were, on the whole, favourable. The accommodation in the asylums was ample, and there was an increase in the percentage of cures, and a decrease in the death-rate. There were 66 deaths, equal to a ratio of 116·9 per 1,000 of average strength, against 104 or 182·2 in 1892. The death-rate varied from 24·3 per 1,000 at Waltair and 177·9 at Calicut, to 113·8 at Madras. The decrease in the death-rate was attributed chiefly to the immunity from epidemic cholera enjoyed by the asylums, and to the early segregation and liberal treatment of the weakly and scorbutic cases. The Local Government state: "The vital statistics correspond, in the main, very closely with those of jails, "and the fall in the death-rate during 1893 in the case of both classes of institutions "is no doubt largely attributable to the greater general healthiness of the year. It "is probable that the improvement in the death-rates of the Madras and Waltair "Asylums is also due to some extent to more careful supervision on the part of "the superintendents." The sanitary condition of the latter asylum seems to be most satisfactory, only one death having taken place, and that being due to no preventable disease.

Bombay. The total population of the six lunatic asylums of the Bombay Presidency (Colaba, Ratnagiri, Poona, Dharwar, Ahmedabad, and Sir Cowasji Jehangir, Hyderabad) was 988, including 275 fresh admissions, against 999 in 1892. In the course of the year 178 patients were discharged, 76 of them as cured, and 77 died, leaving 733 under treatment at the close of the year. There was slightly more sickness in the asylums than in 1892, the daily average sick having increased from 58 to 67, but the death-rate fell from 151·8 per 1,000 of average strength to 107·5. Of the 77 deaths 15 were due to dysentery, 11 each to debility and chronic pneumonic phthisis, 6 to old age, and 5 each to epilepsy and pneumonia, and 11 to remittent fever. The decrease of 35 deaths was spread over all the six asylums. At Colaba, which is the largest of the asylums, about one-third of the total 41 deaths are reported to have occurred amongst the native patients who were committed to the asylum under Section IV. of the Lunacy Act, and who were either exhausted by privation or suffering from grave bodily ailments prior to admission to the asylum, rendering successful treatment almost impossible. Others had been long resident in the institution and their mental and physical state being much reduced they succumbed to the prevailing diseases, viz., dysentery, debility, ague, chronic pneumonic phthisis, and diarrhœa.

Medical Schools.

Bengal. The number of medical schools open in Bengal during 1893–94 was 11, against 10 in the previous year, another unaided school having been opened at Dacca. The

Medical College, Calcutta, is affiliated to the University, and prepares candidates for its various medical degrees. The four Government medical schools train pupils as Civil Hospital Assistants, and the six unaided schools follow their own standards for private practice. The total number of pupils attending the various medical schools in the province rose from 1,545 in 1892-93 to 1,747 in 1893-94.

On the opening of the session in the Calcutta Medical College, 281 students resumed their studies, and 138 were admitted or re-admitted, making a total of 419 (including 13 women), against 401 in the previous year. The strength of the College at the close of the session was reduced to 317. As regards the examinations, 108 candidates (including 1 woman) passed the Preliminary Scientific L.M.S. examination; 35 (including 1 woman) passed the First L.M.S.; 6 passed the Second L.M.S.; 15 (including 1 woman) passed the Preliminary Scientific M.B.; 5 (including 1 woman) passed the First M.B.; and 4 passed the Second M.B. Sixteen military pupils passed and joined the Subordinate Medical Department; 9 Native *dais* passed in midwifery from the Eden Hospital and received certificates of qualification, and 15 pupil-nurses also passed as midwives.

The Campbell Medical School had 306 pupils (including 31 women) on its rolls on the 31st March 1894. Of this number 31 males and 2 women passed out with certificates after re-examination in June 1893, and 50 males and 6 women left the school during the year.

At the Dacca Medical School there were 198 pupils on the rolls, 11 being in the fourth-year class, 25 in the third-year class, 100 in the second-year class, and 62 in the first-year class. Twenty-six students of the third-year class passed the final examination, and obtained certificates of qualification.

The Temple Medical School, Patna, had 200 students (including 6 women) on its rolls, an increase of 17 compared with the previous year. At the final examination for the license 41 candidates appeared and 29 passed. Nine others, who failed in one subject only, were remanded for a further term of study, and subsequently passed; so that there were only three actual failures. No woman student appeared at this examination.

At the Cuttack Medical School there were altogether 118 pupils (including 4 women). At the final examination for the license 22 candidates appeared, including 2 women students, and 19 passed, among whom were the two women.

A large number of women students who have passed out of the Medical College or Schools are reported to have received employment under the Dufferin Fund throughout India.

Good work was also being done in the diffusion of medical knowledge among the people of Bengal by private enterprise. There are six unaided medical schools, two at Dacca, two at Calcutta, and two at Barisal.

North-Western Provinces and Oudh.

The number of pupils of the various classes of the Agra Medical School who attended the examination at the close of the year 1893–94 was 242 (including 49 women) as compared with 203 at the end of the preceding year. At the final examination 29 out of 38 candidates passed. All the military students in this class except two passed, and these had to appear again in one subject each. Of the 20 civil students, all but one were successful in their final examination, while only one private student was completely successful, and one who had failed in the previous year passed on presenting himself for re-examination. Of the students in Class II., comprising second-year military and third-year civil, private, and Rajputana pupils, the military students do not appear to have attained a very high level, no less than seven out of 19 having failed to obtain 200 marks, while only one of the civil pupils was similarly unsuccessful. On the whole the first-year students did well. The female classes did not succeed so well as those for males. "The staff of the school," it is stated, "has a very difficult task before it owing to the low standard of general "education among female pupils, and the Government is doing all in its power to "effect an improvement in the instruction of girls." Only three of the seven fourth-year women students passed, but three others have been allowed to re-appear in certain subjects; and the examination of the third-year class did not appear to give much promise of better results at the next final examination.

Punjab.

The total number of students at the Lahore Medical College and School during 1893–94 was 475 against 397 in the previous year. Of these 189 (including 5 women) were in the College Class, and 286 (including 9 women) were in the Medical School. The number of candidates at the medical examination was much larger than in the

previous year, but the results were far less satisfactory. Fifty-six candidates appeared at the first examination for Licentiate in Medicine and Surgery and only 17 or 30 per cent. passed, compared with 12 out of 40 or 30 per cent. in 1892–93. At the second or final examination 7 out of 34 candidates passed, or a little over 20 per cent., against 15 out of 25, equal to 60 per cent. At this examination one candidate obtained the degree of M.B. At the final examination for the Hospital Assistant Diploma, 59 candidates appeared, of whom 34 passed, including 2 women. The unfavourable results of the year were attributed chiefly to (1) Deficient preliminary education of the students; (2) Inadequacy of the teaching staff of the college in point of numbers; and (3) Defects in the system of examining. "There is no reason whatever to "believe," the Principal of the College reports, "that there has been a falling-off "in the teaching work done in the College." And regarding the attainments of students, he says: "An evidence of the general advance in education in the Punjab "exists in the fact that, with very few exceptions, all the candidates for admission "to the Hospital Assistant class had passed the Anglo-vernacular Middle School "examination, whilst a much larger number than in former years had passed the "entrance examination of the Punjab University. It is quite exceptional now to "find a student who has not some knowledge of English, and many in the Hospital "Assistant class have a fairly good general education."

Madras. The total strength of the Madras Medical College during 1893–94 was 413, being a decrease of 67 on the attendance of the previous year. Of these 26 were women students against 35 in 1892–93. In the Hospital Assistant Department, consisting of 261 pupils, 81 appeared for the College Diploma examination, of whom 71 passed, 10 being placed in the first class. The results of the several University examinations were very unfavourable compared with those of the previous year, only 33 having passed out of 106 candidates entered, against 64 out of 125. In the College Department there were 15 regular students reading for the M.B. and C.M. degree, 51 reading for the L.M.S. degree, and 25 casual students, 2 of whom belonged to the M.B., and the remainder to the L.M.S. section. One of the casual students qualified for the Licentiate in Sanitary Science degree, being the first candidate since the degree was instituted.

The Board Medical School, Nellore, had 43 pupils (including six Mohammedans and seven Brahmans) on its rolls. No candidates appeared for the final examination for the Hospital Assistant grade. At the Prince of Wales' Medical School, Tanjore, there were 15 pupils, 7 of whom were native Christians, and 8 Hindus. Nine candidates appeared for the Hospital Assistant examination, and 8 passed. The Government gold medal was again won by a student from this school.

Bombay. The attendance at the Grant Medical College, Bombay rose from 239 in 1892 to 262 (including 21 women) in 1893. The results of the examinations were not so satisfactory as in the previous year. For the first University examination in medicine there were 65 candidates, of whom only 22 were successful; and for the second examination in medicine 17 passed out of 54 candidates. For the final examination for the degree of L.M.S. there were 43 candidates, and only 13 were successful. In the final examination the chief failures were in practice of medicine, and some of those considered by the Professors to be among the best students failed to satisfy the examiners. In the Midwife class two soldiers' wives passed through a course of instruction in midwifery and nursing, and qualified for the diploma.

The Government Medical Schools at Poona, Ahmedabad, and Hyderabad continued to work satisfactorily. The number of students was 181, and of these 49 passed the final examination.

VII.—SANITATION.

In Calcutta municipality further progress was made in the improvement of bustees or cluster of native huts. The total amount spent by the Corporation under this head up to the close of 1893–4 was nearly 9 lakhs. Good work was also done during the year in the supply of water to the municipality. Through the completion of two new tanks, the settling tanks at the Palta waterworks have now a united working capacity of 105,000,000 gallons, or five times the requisite daily supply of filtered water. This supply has risen from 16,750,000 gallons in 1889–90 to nearly 20,250,000 gallons in the year under notice, giving a present daily consumption per head of population of 36·66 gallons for the town proper, and of 19·55 gallons for the suburban area. In the course of the year the distribution pipes were extended 16·36 miles, bringing their total length up to 302·09 miles, and the total number of premises connected had reached 24,315. In addition to the filtered water over 4,250,000 gallons of unfiltered water were supplied daily in the towns and suburbs for conservancy purposes generally, through an aggregate of 72·46 miles of pipes. Further improvement was also carried out in the drainage of the municipality. There are now nearly 204 miles of sewers, and the number of premises connected with them is 27,997, of which 437 connections were made during 1893–4. The sewerage system was also being extended in the suburban area. But the most important project to be undertaken is the drainage of the whole suburban area, south and south-east of the town proper. "The extension of "the filtered water supply," it is stated, "has done much for the suburbs, but until "an efficient system of drainage is established the sanitation of that portion of the "municipality cannot be considered satisfactory. The drainage project has been "reported on by Mr. A. J. Hughes, C.I.E., and will now be forwarded for the final "opinion of Mr. Baldwin Latham, who investigated the whole question on the spot on "his visit to Calcutta some years since." Bengal.

The municipalities of the interior of Bengal spent Rx. 161,396 on sanitary works, being an increase of Rx. 13,525 on the sum expended in 1892. The most important schemes in progress were the construction of the waterworks at Arrah and Maniktola, the improvements in those at Burdwan and the introduction of better drainage in Patna and Muzaffarpur municipalities. A good deal of attention was also directed to sanitary improvement in other towns, such as Howrah, where it is proposed to re-organise the conservancy establishment, and Puri, where an attempt has been made to cleanse the Swetganga, the filthiest of its tanks, and to introduce better sanitary arrangements into its numerous lodging houses. Some progress was also made in the scheme for supplying with pure water the municipalities on the left bank of the Hooghly above Calcutta. The several local bodies spent Rx, 21,773 in improving rural areas against Rx. 33,466 in the previous year. Dr. Gregg reiterates the despondent opinions he has expressed on previous occasions of rural sanitation in Bengal, where the people continue to disregard the most elementary rules of hygiene, but the Lieutenant-Governor is of opinion that, tedious though the process may be, reform must be left to spontaneous development. A further sum of Rx. 36,989 was spent during the year by private individuals on sanitary works, which consisted for the most part of tanks and wells; and large sums have been contributed on this account in various districts by the wealthy nobility and gentry of the locality.

The Bengal Sanitary Board was not able to hold any formal meetings, owing, as usual, to the continued absence of one or two of the members on tour. The chief work which engaged the attention of the Board was the preparation of the scheme for supplying filtered water to the municipality of Howrah. The scheme as first designed contemplated an intake in Bellore, two miles north of the town, but arrangements have since been made which will enable the water to be taken from the Hooghly river at Serampore, about a mile below the head works of the Calcutta water supply. The estimated cost is Rx. 148,698, which provides for a supply of 10 gallons a head for a population of 125,000, the actual population being 116,000. Survey work for the drainage and possible sewering of the town of Howrah was still being carried on. The Engineer to the Board and the officiating Sanitary Commissioner were occupied on a committee to enquire into the purity of the Darjeeling water supply. Their report had been submitted to the Government, and the further consideration as to what steps should be taken was engaging the attention of the Board. In addition several smaller

schemes were considered by the Board, and they advised municipalities on various projects, chief among which were the sewering and drainage of Dacca and the improvement of the drainage of Jessore.

North-Western Provinces and Oudh.

In the North-Western Provinces and Oudh much good sanitary work was either carried out or in progress during 1893. Out of an income of Rx. 507,817, the municipalities expended Rx. 203,524 on water supply, Rx. 10,678 on drainage, and Rx. 80,444 on conservancy. The waterworks at Allahabad, Agra, and Benares worked satisfactorily, and it is stated that in the two first towns the number of deaths from dysentery and diarrhœa, "diseases which are undoubtedly associated with a bad water "supply," was considerably less in 1893 than in any of the preceding 12 years. The waterworks at Cawnpore and Lucknow were nearly completed, and have since the close of the year commenced work. Measures were taken with a view to extending the water supply at Naini Tal to the upper settlement. The Mussoorie waterworks were completed, and the Dehra scheme was ready to be taken in hand. The extensive drainage scheme at Benares made favourable progress. A similar scheme for Cawnpore was under consideration. The sewage scheme at Naini Tal was in working order, but the method for disposing of the sewage proved unsatisfactory and has since had to be revised. Various sanitary improvements were also carried out at Hardwar, but much remains to be done before the sanitary arrangements of the place can be held to be satisfactory. "There can be no doubt," the Sanitary Commissioner says, "that the major and minor works of sanitation, the extension of general drainage, "&c. carried out in these provinces of late years, have been effective in greatly "ameliorating the sanitary condition of, and in raising the standard of health and "comfort among the people."

The Sanitary Board held several meetings in the course of the year, but the work done was not great. Its constitution has been revised, but it remains to be seen whether the Board can be advantageously employed except as a consultative body. The rules framed by it to give effect to village sanitation were expected to be shortly brought into force.

Punjab.

The expenditure on sanitary works in the municipalities of the Punjab during 1893 amounted to Rx. 101,598 against Rx. 147,243 in 1892. Among the more important works completed in the province were the Simla waterworks and sewage extension scheme, the Kohat town and cantonment water-supply works, and the Ludhiana drainage scheme. The intra-mural drainage scheme at Gujranwala was also practically completed. The Delhi waterworks were nearly completed, and the drainage scheme was in progress. The Umballa water-supply scheme had been commenced, the wells having been sunk and pipes laid down in some places. A survey had been made for a scheme for the protection of the town of Gujrat from the Bhimbar floods, and the drainage scheme for the town of Dera Ghazi Khan was in hand. A scheme for providing the town of Bhiwani with a water supply from the Western Jumna canal was referred to the Provincial Sanitary Board. In addition, several native gentlemen constructed works of public utility at their own expense during the year. A sum of Rx. 11,373 was realised from the sale of manure and town sweepings.

The Provincial Sanitary Board met twice during the year, when they considered several important schemes. The scheme for the appointment of a Sanitary Engineer for the whole province had been abandoned for the present, in consequence of the difficulty of providing the necessary funds.

Burma

In Burma the Public Works Department spent on sanitary works Rx. 8,132, of which Rx. 3,586 were expended on water-supply, and Rx. 2,962 on drainage. At Rangoon works were in progress with a view to supplying water under increased pressure. A reservoir is being constructed on Pagoda Hill capable of holding 1,000,000 gallons, and into which water to the extent of four times its capacity will be pumped daily. The reclamation of the low-lying lands to the east of the city was being continued. The Shone and Ault sewerage system has been working in the city for three years, and over 1,500 houses have been connected with it, of which 416 connections were made during 1893, and 30 night-soil depôts were closed. "The advantage of this system," the Sanitary Commissioner says "combined with the water-supply, is seen in "the death-rate of the town proper (29·97) as compared with that for the town as a "whole (34·39), and that of some suburbs (North Kemmendine), 48·90." In the outlying parts of the town considerable progress has been made in conservancy and drainage, but the objectionable tanks situated in the heart of the city had not been filled in. In Moulmein a conservancy scheme has at last been adopted, for which a

scavenging tax has been imposed, and the system will be extended gradually. In Akyab proposals to extend the conservancy of the town have been formulated. All cesspits are to be closed, latrines introduced, and the night-soil systematically and punctually removed and trenched. At Prome a large number of cess-pits were closed, six new latrines were erected, and improvements effected in the water supply. About 25,000 out of the 30,022 inhabitants of this town are now supplied with water from the works, and the health of the people is stated to have considerably improved since their construction. In Mandalay deliberations upon water-supply and scavenging schemes continued, but nothing was settled. In Upper Burma, conservancy was fairly well attended to in the towns as far as funds permitted.

The Sanitary Board of the province made but little progress, the appointment of a Sanitary Engineer being still deferred pending completion of the surveys of selected towns.

Central Provinces.

Out of their total income of Rx. 167,872, the 19 municipalities in the Central Provinces spent Rx. 3,911 on water supply and Rx. 19,439 on conservancy. The Balram Dass waterworks at Raipur, which were opened at the end of 1892, were improved by the addition of a dam, the object being to keep up the water level during the summer months, and afford a greater head over the galleries. The Raj-nandgaon waterworks were opened by the Chief Commissioner on the 19th January, 1894, and a constant supply to the town has been maintained. The water supplied is reported to be clear and good, and so much appreciated by the inhabitants, that they have entirely given up the use of tank water for domestic purposes. Since the close of the year an estimate was sanctioned for the Jubbulpore waterworks extension, amounting to Rx. 24,410, and new schemes for water supply to the towns of Khandwa and Harda were under consideration. The most important minor sanitary works carried out were those done under the direction of the Sanitary Board. They consisted chiefly of improvements of village water supplies by construction of new wells, improvements of others, provision for low castes being specially attended to, also drainage and cleaning of sites. The constitution of the Sanitary Board was being revised, and fresh rules were being framed for the conduct of its business.

Assam.

No sanitary work of any magnitude was executed in Assam during 1893, but considerable attention was devoted to the improvement of the water supply, drainage, and conservancy of towns in the province. The ratio of expenditure on sanitary works to the total income of the municipal bodies was practically the same as in the previous year, being 60·0 per cent. as compared with 60·3 The Shillong waterworks were completed, and an ample supply of good water is now available in that station. Certain improvements to the waterworks of Gauhati were made; and steps were being taken to provide Sylhet with an abundant and pure water supply. The subject of rural sanitation continued to engage the attention of Local Boards. Certain sums are placed annually at the disposal of the boards, which they are required to apply to this purpose, and a considerable number of wells were constructed during the year in the villages of the Sylhet, Goalpara, Darrang, Nowgong, and Sibsagar districts, and drains were made in some of the markets and larger villages of the Cachar, Nowgong, and Sibsagar districts.

The Provincial Sanitary Board was mainly occupied during the year in directing operations for improving the water supply of villages. The Board do not find it necessary to hold formal meetings, but transacts its business by circulating papers among its members.

Madras.

In Madras City several improvements were carried out in 1893 in the drainage and water-supply. The Black Town drainage scheme was completed at a total cost of Rx. 107,105. The quantity of water supplied to the city was in excess of that of the previous year, but its quality was still not above suspicion. The water from the Red Hills Lake taken in four different places was tested, and in two cases it was declared usable, and in the other two it was suspicious. A sanitary evil in connection with the water supply is reported to exist in the villages on the shores of the Red Hills tank. "So long as they remain there it will be impossible to entirely prevent the possibility "of pollution by men and animals." In the course of the year 1,473 new services were laid, and 1,215 existing services were extended. The report of Mr. Cousins, the sanitary expert, was under consideration. On the subject of the foul-smelling channels in front of the bazaars in the native parts of the town, he writes:—"The wonder is, "not that the mortality returns are so high, but that they are so low under these

" conditions." The estimated cost of carrying out Mr. Cousins' drainage scheme is 23 lakhs and for the improvement of the water supply 21 lakhs.

In the other 55 municipalities of the Madras Presidency, a sum of Rx. 145,345, or 52·8 per cent. of their income was assigned for sanitation, and the actual outlay incurred during the first nine months of the year equalled 70·7 per cent. The work was chiefly of a minor character, consisting for the most part in improvement of water supply, such as sinking, repairing, and cleansing of wells, construction and repairing of drains, public latrines, slaughter-houses, &c., and improvement of village sites. Similar work was carried out by the District Boards at an expenditure of Rx. 62,791, or 7·9 per cent. of income, of which 55·4 per cent. were spent during the last nine months of 1893. Sewage-farming is profitably carried on in the towns of Madras and Tanjore, and during the year it was commenced on a small scale in Negapatam. The advantages of the system was also pressed on the attention of other municipalities, but owing to caste prejudices and want of funds advance in this direction must be slow.

Much good work was again carried out by the Sanitary Engineering Department. During the year seven water-supply and two drainage schemes, estimated to cost Rx. 164,000 were in course of construction. Of these, the Cuddapah water supply and Coonoor drainage works were completed, while the drainage scheme of Kumbakonam was nearing completion. Fair progress was made in carrying out the schemes for the water supply of Madura, Tanjore, and Trichinopoly, but the prevalence of cholera and the occurrence of heavy floods proved serious obstacles to their completion; in fact the November floods practically destroyed the whole of the Trichinopoly waterworks and caused considerable damage to those at Tanjore. The Adoni waterworks scheme was commenced, and the tunnelling works at Dindigul, and the boring works at Cochin were continued. Schemes for the water supply of Conjeeveram and Tuticorin, and the drainage of Karur were under the consideration of Government. Of the 55 district municipalities in the Presidency 36 have now been surveyed by the Department for the purpose of collecting the information necessary for the preparation of schemes of water supply or drainage. As many years must elapse before the majority of the schemes can be completed it has been decided that no further survey should be undertaken for the present. In his remarks on this subject, the Sanitary Engineer says:—" The possibility of the early introduction of " water and drainage works into those municipalities not yet dealt with is a matter " for much consideration. It is feared the outlook is not a very hopeful one, and it " is evident that if sanitation is to advance in this Presidency some steps are " necessary to ensure more funds being available. It is not a matter on which " municipalities can congratulate themselves, nor does it say much for local self-" government that after 20 years of it only 10 towns out of 55 have provided " themselves with either a water-supply or drainage works." With a view to assist municipalities in financing their schemes the Government propose raising the house and water taxes by making necessary amendments to Act IV. of 1884.

Bombay. The expenditure of the Health Department of the City of Bombay on sanitary measures during 1893 was Rx. 119,357 against Rx. 117,552 in 1892. A special Drainage Engineer was appointed from the 1st March 1893 to supervise the three drainage works at Umarkhadi, Colaba, and the Connaught and Sussex roads, the estimates for which amounted to over 11 lakhs. Good progress was being made with these works. Plans and estimates, the latter amounting to over 29 lakhs, were also prepared for the drainage and sewerage of numerous other districts of the city. The erection of the new sewage pumping engines for the Love Grove station was completed, and the engines were at work during the year. The supply of water from the Tansa works continued to be adequate, and the repairs to the Bhandarvada reservoir were completed.

In the other municipalities Rx. 84,375 were devoted to conservancy. In Sind progress was made with the Karachi drainage works and the Sukkur water supply. In the Northern Division of the Presidency the Ahmedabad water-supply and drainage schemes were extended, and schemes for improving the water supply of Dakor, Broach, and Kalyan were under preparation. In the Central Division the new waterworks at Dhulia were nearly completed and others were in progress or under contemplation at various places. In the Southern Division the waterworks at Hubli were opened for public use at the close of the year, and the water-supply project at Dharwar was awaiting the final orders of Government.

The Sanitary Board travelled through Sind and advised the several municipalities concerning improvements in water supply and drainage, and also gave their opinion regarding the general sanitary details of a large number of miscellaneous projects. The Board also drew out a plan to show the general lines on which rubbish and night-soil depôts should be laid out, and distributed copies of the plan to the different municipalities. A plan of slaughter-house for small towns was also prepared by the Board and distributed in like manner.

In the province of Berar the 11 municipalities, of which three were new, spent 45·7 per cent. of their income on water supply, 16·6 per cent. on conservancy, and 2·7 per cent. on drainage. A general scheme for the drainage of Amraoti town at an estimated cost of Rx. 48,693 was approved by the municipal committee. In Akola the new water-supply scheme, towards which the sum of Rx. 14,600 was contributed by the municipality, was nearing completion. The drainage of the town of Khamgaon was being steadily carried on to completion, as was also that of the town of Shegaon. In addition to the above expenditure a sum of Rx. 9,358 was spent by District Local Boards on works of sanitary improvement. Good work was done in placing the sanitary arrangements at fairs upon a definite footing. "The conservancy, water "supply and medical supervision of fairs have now been put on a proper sanitary "basis, which will reduce to a minimum the liability to infectious disease of the "people attending these gatherings." Berar.

The Sanitary Board met six times during the year, once at each district head-quarters. They considered the several recommendations made in the sanitary surveys of towns and villages, and recorded such remarks and suggestions as seemed necessary for the guidance of the local bodies concerned, reviewed and remarked upon the reports of village sanitary boards, and ascertained the progress made in the completion of schemes proposed at previous meetings. Out of a total of 39 towns only eight remained to be surveyed, but a very large proportion of the villages had still to be taken in hand.

W. T. Ronson.

India Office,
August, 1895.

ABSTRACTS

OF

SANITARY AND OTHER REPORTS

FOR

1893.

ABSTRACT OF REPORT OF THE SANITARY COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR 1893.

(*Surgeon-Major General W. R. Rice, C.S.I., M.D.*)

European Troops.

Sickness and mortality in 1893.

The health of the European Army in India, so far as indicated by the admissions into hospital and deaths, was better in 1893 than in 1892; but the number constantly sick was larger, showing that the sickness must have been more severe, and in consequence the average duration of the cases more prolonged.

Abstract of Statistics of European Troops in India.

Year.	Strength.	Ratio per 1,000 of Strength.				
		Admissions into Hospital.	Constantly Sick.	Deaths.	Invaliding.	Total Loss.
1870–79	57,742	1,475	60	19·34	43	62
1881–90*	61,399	1,471	73	14·24	27	42
1882–91	62,229	1,448	74	14·17	26	40
1891	67,030	1,379	79	15·89	27	43
1892	68,137	1,517	84	17·07	24	41
1893	70,091	1,415	87	12·61	25	38

* Including troops in Afghanistan during 1881.

The chief causes of admission were venereal diseases, ague, injuries, skin diseases, respiratory diseases, rheumatism, and simple continued fever. Excluding venereal diseases, the only others with increased admission rates were injuries, alcoholism, small-pox, "other fevers," and spleen diseases, and for each of these the increase was very small. But the increase in venereal diseases was very considerable, there were 32,663 admissions from this cause, or 466 per 1,000 against 410 in 1892. The admission rate for cholera fell from 2·5 to ·2 per 1,000, that for influenza from 12·7 to ·3, ague from 429·1 to 364·5, and sore-throat from 39·0 to 28·0 Venereal diseases caused 33 per cent. of the total sickness, and ague 26 per cent.

The chief causes of mortality were enteric fever, hepatic abscess, pneumonia, tubercle of the lungs, dysentery, and injuries. Among the diseases with increased mortality were small-pox (·06 per 1,000 against ·04), pneumonia (·70 against ·62), alcoholism (·21 against ·10), and other respiratory diseases. Mortality from cholera fell from 1·78 to ·14, and that from all fevers, dysentery and hepatic abscess was lessened. Enteric fever caused 42 per cent. of the total deaths, and injuries 8 per cent.

The chief causes of invaliding were, in order, syphilis, debility, malarial cachexia, palpitation, ague, valvular disease of the heart, and tubercle of the lungs.

Bengal Army.

In the European army of Bengal, there was a decrease in the admissions and mortality, but an increase in the numbers invalided and constantly sick.

European Army of Bengal.

Period.	Strength.	Ratio per 1,000 of Strength.						
		Admissions into Hospital.	Constantly Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870-79	363,433	1,522	61	4·18	16·82	21·00	41	62
1881-90*	38,008	1,552	74	1·48	13·00	14·48	26	40
1882-91	38,517	1,519	75	1·46	13·04	14·50	25	39
1891	40,994	1,394	80	2·78	14·08	16·86	25	42
1892	42,198	1,582	87	2·42	17·39	19·81	23	42
1893	43,150	1,466	91	·11	14·24	14·35	26	40

* Excluding troops in Afghanistan during 1881.

The most prevalent diseases were those of venereal origin, ague, diseases of the integumentary system, lungs and intestines. Injuries caused 97·5 admissions per 1,000. Among the diseases with increased admission rates were venereal (462·3 per 1,000 against 412·4), pneumonia and small-pox, but in the case of the two latter the increase was very trifling. On the other hand, the admission rates for influenza (·0 compared with 14·8), cholera, enteric and all other fevers, dysentery and diarrhœa were lessened. Venereal diseases caused 32 per cent. of the total sickness, and ague 28 per cent.

The chief causes of death were enteric and malarial fevers, lung and hepatic diseases, and injuries. Among the diseases with increased mortality were pneumonia (·93 against ·81), alcoholism (·23 against ·09) and small-pox. On the other hand, mortality from cholera, all fevers, dysentery and hepatic diseases was lessened. Enteric fever caused 44·6 per cent. of the total deaths, injuries came next, but at a long interval, causing 6·6 per cent.

The chief causes of invaliding were, in order, malarial fevers and their results, debility, venereal diseases, heart diseases, and tubercle.

Madras Army.

The mortality during 1893 was only 9·54 per 1,000. There is no record of an equally low death-rate in any former year.

European Army of Madras.

Period.	Strength.	Ratio per 1,000 of Strength.						
		Admissions into Hospital.	Constantly Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870–79	11,040	1,264	60	1·68	16·01	17·69	49	67
1881–90	11,759	1,257	73	1·05	11·94	12·99	28	41
1882–91	12,052	1,270	75	1·05	12·28	13·33	28	41
1891	13,324	1,304	82	1·58	12·91	14·49	31	46
1892	13,227	1,236	83	·53	11·79	12·32	33	45
1893	13,419	1,230	85	·07	9·47	9·54	26	36

The chief forms of sickness were venereal and malarial diseases, injuries, and diseases of the skin. Among the diseases with increased admission rates were alcoholism (7 per 1,000 against 4·4), venereal diseases (481 against 415 per 1,000), skin diseases, and tubercle of the lungs. On the other hand, the admission rates for influenza, cholera, malarial fevers, and dysentery were lessened. Venereal diseases caused 39 per cent. of the total sickness, and ague 11 per cent.

The chief causes of death were, in order, enteric fever, injuries, hepatic abscess, tubercle of the lungs, and nervous diseases. Among the diseases with increased mortality were enteric fever, hepatic abscess, and heart diseases. On the other hand, mortality from cholera, small-pox, and malarial fevers was lessened. Enteric fever caused 35 per cent. of the total deaths, and injuries 13 per cent.

The chief causes of invaliding were venereal diseases, debility, malarial fever and its effects, anæmia, dysentery, valvular disease of the heart, rheumatism, and hepatitis.

Bombay Army.

The death-rate for the year, as in the case of Madras, is the lowest on record, being only 10·13 per 1,000.

European Army of Bombay.

Period.	Strength.	Ratio per 1,000 of Strength.						
		Admissions into Hospital.	Constantly Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870–79	10,359	1,533	57	1·53	13·74	15·27	43	58
1881–1890*	11,378	1,431	69	1·87	12·03	13·90	32	46
1882–91	11,660	1,399	69	2·08	11·89	13·97	30	44
1891	12,713	1,409	73	2·60	11·64	14·24	29	43
1892	12,712	1,593	74	·94	11·96	12·90	21	34
1893	13,522	1,434	75	·29	9·84	10·13	22	32

* Excluding troops in Afghanistan during 1881.

The chief forms of sickness were venereal diseases, ague, injuries, and diseases of the skin. Among the diseases with increased admission rates were other fevers (6·0 per 1,000 against ·3), venereal diseases (463·5 against 396·1), small-pox, and dysentery. On the other hand, the admission rates from influenza, cholera, all fevers, and tubercle were lessened. Venereal diseases caused 32 per cent. of all sickness, and ague 31 per cent.

The chief causes of mortality were enteric fever, injuries, heatstroke, hepatic abscess and dysentery. Among the diseases with increased mortality were alcoholism, ague, dysentery, and respiratory diseases. On the other hand, mortality from cholera, enteric fever, and hepatic abscess was lessened. Enteric fever caused 36 per cent. of the total deaths, and injuries 9 per cent.

The chief causes of invaliding were, in order, debility, ague and its effects, syphilis, and heart disease.

There was a marked increase of sickness amongst the European troops stationed at Quetta. The admissions for ague were more than doubled, and there was an increase in venereal disease.

Period.	Strength.	Ratio per 1,000 of Strength.				
		Admissions.	Constantly Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1884	1,441	2,056	82	27·07	41·63	68·70
1885	1,672	2,187	94	42·46	40·67	83·13
1886	1,752	2,442	73	20·57	19·41	19·98
1887	1,932	1,374	52	1·03	10·35	11·38
1888	2,223	1,140	59	—	13·50	13·50
1889	2,210	1,152	58	0·90	9·05	9·95
1890	2,019	1,099	58	—	9·41	9·41
1891*	2,162	1,621	62	6·48	7·40	13·88
1892*	2,213	1,522	72	—	9·94	9·44
1893*	2,099	2,138	102	—	21·44	21·44

* Excluding troops on the march.

There was more sickness at Gnathong during 1893 than in 1892, chiefly owing to increase of venereal diseases.

Period.	Strength.	Ratio per 1,000 of Strength.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1890	78	1,782	64	—	38·46	38·46
1891	104	1,192	58	—	9·62	9·62
1892	112	1,027	45	—	—	—
1893	106	57	66	—	9·43	9·43

The health of the troops in Burma has improved steadily since 1889. But unfortunately the improvement as regards sickness from malarial fevers is almost counterbalanced by increased prevalence of venereal diseases. In 1893 the admissions from this cause amounted to 503·1 per 1,000.

European Troops in Burma.

Period.	Strength.	Ratio per 1,000 of Strength.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1889	4,825	1,903	92	2·49	26·73	29·22
1890	4,712	1,743	102	—	20·80	20·80
1891	4,623	1,589	92	2·38	17·74	20·12
1892	4,316	1,491	91	—	14·83	14·83
1893	3,928	1,461	96	·25	12·73	12·98

Some of the more important causes of admission into hospital in the three Presidencies are shown in the following table in the direct order of their decennial ratios :—

Admitted per 1,000 *of strength.*

Admissions from	Bengal.			Admissions from	Madras.			Admissions from	Bombay.		
	1892.	1893.	1882 to 1891.		1892.	1893.	1882 to 1891.		1892.	1893.	1882 to 1891.
Venereal diseases	412	462	377	Venereal diseases	415	480	380	Venereal diseases	396	463	354
Ague	482	410	362*	Ague	166	138	238*	Ague	527	443	322*
Simple continued fever	55	21	72*	Dysentery	45	36	53	Simple continued fever	86	33	79*
Diarrhœa	36	28	44	Simple continued fever	62	52	73*	Diarrhœa	37	21	42
Dysentery	25	22	25	Diarrhœa	8	2	37	Dysentery	19	20	22
Respiratory diseases	40	37	38*	Hepatitis	28	26	34	Hepatitis	16	13	19
Rheumatism and neuralgia.	31	34	29*	Rheumatism and neuralgia.	40	40	37*	Rheumatism and neuralgia.	26	31	31*
Hepatitis	18	17	23	Respiratory diseases	30	23	26*	Respiratory diseases	27	19	28*
Enteric fever	27	25	17	Enteric fever	12	11	10	Enteric fever	18	13	11
Remittent fever	16	12	9	Remittent fever	11	6	8	Remittent fever	7	5	8
Phthisis pulmonalis	4	3	5	Influenza	12	1	7	Phthisis pulmonalis	5	4	6
Influenza	15	—	4	Phthisis pulmonalis	2	4	4	Spleen diseases	2	2	3
Spleen diseases	3	3	4	Spleen diseases	—	1	1	Influenza	6	—	2
Total from all causes	1,582	1,466	1,519	Total from all causes	1,236	1,230	1,270	Total from all causes	1,593	1,434	1,399

* For six years, 1886-91.

Venereal diseases caused the largest number of admissions; in the Madras Presidency these diseases were three times more numerous than the cases of ague.

Enteric fever is much more prevalent in Bengal than in either Madras or Bombay; so also is remittent fever. On the other hand, simple continued fever appears to be more prevalent in Madras than in Bombay and Bengal; the same remark applies to dysentery. As might be expected, respiratory diseases are commoner in Bengal than in either Madras or Bombay; and the form of pneumonia which occurs in Bengal appears to be more fatal than that in the other two Presidencies.

Some of the more important causes of death in the three Presidencies are shown in the following table :—

Deaths from the Chief Diseases and from all Causes in the three Presidencies per 1,000 *of strength.*

Deaths from	Bengal.			Deaths from	Madras.			Deaths from	Bombay.		
	1892.	1893.	1882-91.		1892.	1893.	1882-91.		1892.	1893.	1882-91.
Enteric fever	6·40	6·40	4·73	Enteric fever	3·18	3·35	2·95	Enteric fever	5·03	3·70	3·36
Cholera	2·42	·05	1·46	Hepatic Abscess	·98	1·12	1·92	Cholera	·94	·29	2·08
Hepatic Abscess	1·28	·93	1·19	Hepatic Congestion and inflammation	·15	—		Hepatic Abscess	·63	·52	·89
Hepatic Congestion and inflammation	·07	·07		Cholera	·53	·07	1·05	Hepatic Congestion and inflammation	·08	—	
Phthisis pulmonalis	·75	·70	·79	Dysentery	1·29	·60	·90	Dysentery	·08	·52	·86
Pneumonia	·81	·93	·87*	Remittent fever	·38	·15	·76	Phthisis pulmonalis	·55	·44	·69
Other respiratory diseases	·17	·16		Phthisis pulmonalis	·60	·67	·54	Remittent fever	·24	·07	·51
Dysentery	·59	·49	·55	Pneumonia	·30	·22	·57*	Pneumonia	·31	·44	·55*
Remittent fever	1·59	·74	·43	Other respiratory diseases	·08	·07		Other respiratory diseases	·16	·22	
Diarrhœa	·09	—	·04	Diarrhœa	—	—	·11	Diarrhœa	·16	—	·09
Total from all causes	19·81	14·35	14·50	Total from all causes	12·32	9·54	13·33	Total from all causes	12·90	10·13	13·97

* For six years, 1886-91.

In all three Presidencies enteric fever causes the largest number of deaths; next to it, and also in all three Presidencies, comes hepatic abscess. In Bengal there were 40 deaths from pneumonia, or ·93 per 1,000, whereas in Madras and Bombay the corresponding rates were ·22 and ·44. But in all three Presidencies the death-rate

has fallen. The percentage respectively of enteric fever, hepatitis, dysentery, and pneumonia in the total deaths of each presidency was :—

1893.

	Bengal.	Madras.	Bombay.
Enteric fever	44·6	35·2	36·5
Hepatitis and hepatic abscess	7·0	11·7	5·1
Dysentery	3·4	6·2	5·1
Pneumonia	6·5	2·3	4·4

Bengal again shows the highest mortality from enteric fever and pneumonia.

Of the large garrisons, with a strength of over 1,000, the following returned death-rates considerably higher than the death-rate of their presidencies :—

Stations.	Average Strength.	Ratio per 1,000 of Strength.		Chief Causes of Mortality per 1,000 in 1893.								Total Number of Deaths in 1893.
		1892.	1893.	Cholera.	Enteric Fever.	Remittent Fever.	Dysentery.	Diarrhœa.	Abscess of Liver.	Pneumonia.	Tubercle of the Lungs.	
Meerut	2,213	19·66	17·17	—	8·59	—	1·80	—	—	·45	—	38
Sialkot	1,034	15·19	18·38	—	9·67	—	·97	—	·97	—	·97	19
Peshawar	1,636	56·74	27·51	—	7·95	9·78	—	—	1·83	1·22	·61	45
Kurrachee	1,270	18·96	11·81	—	·79	—	·79	—	·79	2·36	1·57	15
Agra	1,126	19·76	21·31	—	12·43	·89	—	—	4·44	—	1·78	24
Quetta	2,099	9·94	21·44	—	2·38	·48	·95	—	·95	6·67	·48	45

Agra, Sialkot, and Meerut suffered severely from enteric fever, while at Quetta there were 14 deaths from pneumonia.

According to the following table, issued by the Quartermaster-General in India, 15,463 men of the Bengal Army, or 35·05 per cent. of strength, were located in the Hills on the 1st June 1893, but Quetta and Gnathong are not included in this table :—

Statement showing the Number of European Troops, &c. located in the Hills on 1st June 1893.‡

Name of Accommodation.	Men.	Women.	Children.
Hill Depôts	2,565	206	458
Regular Hill Stations	5,202	178	298
Temporary Locations	7,696	207	439
Mussoorie Summer Home	—	—	54
Total*	15,463	591	1,249
Percentage to Total Strength	35·05†	39·93†	47·89†

* As on 1st June.
† Excluding 32 men, 40 women, and 92 children of the unattached list.
‡ Excluding Gnathong and Quetta.

Principal diseases: Influenza.

As there were only 21 cases of influenza in the European army throughout India, it is no longer necessary for the present to consider influenza as one of the principal diseases. Of these 21 cases, 19 occurred in one station, viz., at Bangalore, north.

Cholera.

Throughout the European army in India there were only 16 cases of cholera, with 10 deaths; nine of the cases occurred in Bengal, six in Bombay, and one in Madras.

Of the Bengal cases, four occurred at Umballa. The Medical Officer is of opinion that the disease was imported by human intercourse, because towards the end of April cholera broke out in a gang of coolies working on the Simla road, there being 12 cases with six deaths, whereupon, it is said, the coolies ran away and "doubtless made

"their way to Umballa." The evidence is neither complete nor conclusive. The Medical Officer is unable to say that any of these coolies did in fact enter Umballa, and therefore, equally unable to state that they came into any sort of communication, direct or indirect, with the soldiers affected. And when it is remembered that April and May are precisely the months in which, in years of epidemic cholera, the disease makes its appearance at Umballa, too much importance must not be attached to the fact that all the four cases occurred in May. Only one of these cases died.

At Meean Meer there were three cases, all of which died. They all occurred within 36 hours, on the 3rd and 4th May. Two of the men belonged to one regiment, but to different companies; while the third case occurred at a distance of two miles from the others. The Medical Officer considers that the disease may have been conveyed by either the soda-water or the ordinary drinking water. But there are objections to this, as there would be to almost any other hypothetical explanation of the outbreak. If the water was the cause, how came it that only three men were affected, one of whom lived at a distance of two miles from the others? Why did the infection continue for two days only?

Of the two cases, both fatal, at Ahmednagar, one occurred in the beginning of August, when the disease was epidemic in the adjacent villages; but the other did not occur until October, some weeks after the last case of cholera in the district.

Enteric fever.

The following shows those garrisons of India which had an average strength of over 1,000 in 1893, with their decennial ratios for reference:—

ENTERIC FEVER IN 1893 AND IN THE DECENNIUM 1882–91.

Stations over 1,000 *strong.*

Stations.	Admission-rate per 1,000 of Strength in 1893.	Death-rate per 1,000 of Strength in 1893.	Died out of each 100 Cases treated in 1893.	Decennium 1882–91.	
				Admission-rate.	Death-rate.
Sialkot	49·3	9·67	15·87	32·1	8·13
Agra	42·6	12·43	28·00	13·9	4·46
Meerut	36·6	8·59	22·35	15·9	4·93
Umballa	35·8	10·57	25·27	10·6	2·49
Rawal Pindi	31·5	9·71	25·89	19·9	5·34
Lucknow	27·2	4·09	11·46	32·7	5·62
Bareilly	21·7	3·34	12·12	34·2	8·67
Allahabad	17·8	2·43	11·11	19·3	5·17
Bangalore	17·4	2·42	13·16	18·1	3·66
Secunderabad	15·7	5·22	25·00	19·4	5·40
Peshawar	14·7	7·95	54·17	10·4	4·33
Ferozepore	13·3	4·74	35·71	11·8	3·85
Poona	11·8	4·94	35·71	10·5	3·58
Colaba (Bombay)	8·7	4·35	45·46	4·6	1·59
Quetta	8·1	2·38	25·00	14·0	3·67
Mhow	6·3	2·52	40·00	19·2	5·31
Kurrachee	5·5	·79	11·11	22·4	4·00
Fort William	3·5	1·76	50·00	3·7	2·21

On the whole there has been a slight decrease in both the admissions and deaths due to enteric fever. In Bengal and Madras this improvement is hardly appreciable, but in Bombay it is more marked, because in this Presidency the admissions for enteric have fallen from 17·5 per 1,000 in 1892, to 12·8 per 1,000 in 1893, and the deaths from 5·03 per 1,000 to 3·70.

Amongst the stations at which enteric fever was specially prevalent were Agra, Meerut, Lucknow, Rawal Pindi, Campbellpur, and Cherat. At Agra, out of 48 cases, no less than 42 occurred in one regiment, the East Surrey, although there was a battery of artillery living in an adjoining barrack, and under precisely the same conditions of service. Nor had the East Surrey Regiment lately arrived from England; it had been in India for nearly ten years. It arrived at Agra in February. The Medical Officer suggests no explanation, either of the origin and cause of the epidemic, or of its quite disproportionate incidence upon the men of one regiment. The Chemical Examiner of the North-West Provinces, Mr. Hankin, found typhoid bacilli in the ærated waters and the *dahi* supplied to the East Surrey Regiment. He adds that, owing to precautions which have been taken on his suggestion, the ærated

waters are no longer open to suspicion; but so long as bazar *dahi* is eaten in the shape either of cream-cheese or sweetmeats there is danger of the introduction of the typhoid bacillus. The typhoid bacilli found in the *dahi* examined are derived, Mr. Hankin adds, from contaminated well-water. He considers the idea that enteric fever may be caused by "fatigue and exposure without any help on the part of microbes" to be "old-fashioned, and grotesque but labour-saving."

It is generally stated that in India the majority of cases of enteric fever occur in the hot-weather months before the rains; but at Lucknow in 1892 and 1893 this was not the case, as in both years the largest number of cases and deaths took place in the fourth quarter of the year. The medical officer states that "the disease prevailed "in the European Infantry lines in November and December; no cause could be "positively traced in any of the cases. The water in the cavalry lines was examined "for bacteria, and no enteric germs could be found. Enteric germs were ultimately "found in a drain running at some distance from the cavalry barracks nearest to it; "this drain has been disinfected and steps taken to have it kept thoroughly clean."

Cherat.—The proportion of cases of enteric fever at this hill sanitarium exceeded that of any other station in India, being 75·9 per 1,000 of strength. The cases occurred throughout the stay of the troops there: in May there were 11 cases, in June 3, in July 3, in August 4, in September 12, and in October 3. The medical officer is of opinion that the disease was brought up from the plains, and adds that the drinking-water at one of the camping-grounds was afterwards found to be unfit for use. It was also found that the ærated waters sold in the bazaar were made with very impure water. The mortality was high, being 36 per cent. of the cases treated.

Lower Topa.—At this hill station the proportion of admissions for enteric fever was 74·4 per 1,000 of strength. The medical officer attributed the outbreak to impure milk. He recommended that the milk should be obtained elsewhere, and after this was done there was no more cases of enteric fever. The mortality was low, being only 11 per cent.; in fact only one case died.

Campbellpur.—The admission-rate for enteric fever at Campbellpur was 73·9 per 1,000; out of 19 cases 3 died, being a mortality of 15·8 per cent. The sanitary condition of the barracks was satisfactory. The medical officer states that "it was impossible to "discover the cause, as the sanitary condition of the barracks is as satisfactory as can "be expected. The milk supply, however, remains a weak point, and the closure of "the dairy a couple of years ago may account for the increase of the disease during "the last two years."

Thobba.—At Thobba there were 8 cases with 5 deaths, the fatality being at the rate of 62 per cent.

Sialkot.—Here there were 51 cases with 10 deaths, or ·19·6 per cent. The medical officer states that in May "a wave of enteric passed over the station;" there were 34 cases in May, 10 in June, 3 in July, 1 each in September, October, and November. Of the 51 cases, 30 occurred in the 11th Hussars, who had quite recently arrived from South Africa.

Origin of the Outbreak.—The medical officer attributes this to the impure condition of the well water in May, but he adds that if this was the cause, it is strange that the women and children living in the lines should have escaped without a single case. He considers that the milk supply was not open to suspicion.

The inquiries made by several medical officers have led them to conclude that some cases of enteric fever are caused by the emanations from typhoid stools in latrines. The medical officer in charge of the Station Hospital at Kirkee states that men suffering from fever and diarrhœa often allow these to run on for a week or more before they go to hospital, and are only then to be found suffering from enteric fever. Such cases, he believes, are frequent sources of infection, through the latrines. The principal medical officer of the Bombay Army, in a marginal note on that report, states that he agrees with this opinion, and that at Suakim in 1885, and at Poona in 1891 and 1892, he had reason to think that enteric fever was communicated by means of the latrines. In this connection a case which occurred at Poona in 1893 is relevant: "the man had been employed for some time before admission in scraping and "re-constructing a drain leading from the prison laundry. This drain was polluted "with fæcal matter. Another soldier who was put on to continue the work had after "a while severe diarrhœa and intestinal affection. This may have been the source "from which the man was infected."

The following table shows the greater liability of the young soldier to die from enteric fever, and the decreasing liability with advancing age :—

Statement showing the Death Ratios of the European Army from Enteric Fever at different Ages, together with the Ratios of Liability to it.

Year.	Mortality from Enteric Fever and Ratio of Liability to it at Different Ages.					
	24 and under.		25 to 29.		30 to 34.	
	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.
1889	9·81	64·50	3·25	21·37	1·83	12·03
1890	7·78	65·93	2·84	24·07	1·18	10·00
1891	9·11	68·65	2·97	22·38	·71	5·35
1892	8·44	64·87	2·92	22·44	1·65	12·68
1893	7·77	60·89	2·91	22·81	2·08	16·30

Again, the following shows that the recently arrived soldier is more apt to die from enteric fever than he who has been longer in the country, and that with increased length of service in India the liability to death from enteric fever rapidly diminishes :—

Statement showing the Death Ratios of the European Army from Enteric Fever at different Periods of Residence in India, together with the Ratios of Liability to it.

Year.	Mortality from Enteric Fever, and the Ratio of Liability to it at Different Periods of Residence in India.					
	1st and 2nd Years.		3rd to 5th Year.		6th to 10th Year.	
	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.
1889	11·65	57·02	4·20	20·56	2·43	11·89
1890	10·21	66·47	2·98	19·40	2·17	14·13
1891	11·60	64·19	3·64	10·14	2·23	2·34
1892	10·69	65·99	3·36	20·74	2·15	13·27
1893	9·88	63·17	3·20	20·46	1·89	12·08

The following table shows that the three Presidencies by no means agree in their seasons of greatest prevalence of typhoid fever :—

Quarterly Percentage of Enteric Fever in the three Presidencies in 1893.

Presidencies.	January to March.	April to June.	July to September.	October to December.	Total.
Bengal	7	42	30	21	=100
Madras	18	30	47	15	=100
Bombay	22	30	40	8	=100
India	10	38	33	19	=100

In Bengal the season of greatest prevalence is, apparently, between 1st April and 30th June, in other words, during the hottest months of the year, but the disease continues, though its victims are somewhat fewer, during the rainy months also. But there are exceptions to this rule: Lucknow, as already mentioned, is one of them. Regarding the cases at Sialkot, which were most numerous in May and June, the medical officer (Surgeon-Lieutenant-Colonel Allin) gives the following opinion :—"Of "course during the outbreak in May the water in the wells was low owing to the dry "weather; I cannot help attributing the cause of the outbreak in May to the well-"water supply; at the same time there is the fact that no case occurred amongst the "women and children who were living in the lines."

Of the 48 cases at Agra, 22 occurred in the rainy months of July, August, and September. In Umballa, the admissions were distributed as follows over the months

between the beginning of April and the end of December. Of the 78 cases, 5 were admitted in April, 18 in May, 9 in June, 4 in July, 6 in August, 13 in September, 5 in October, 7 in November, 10 in December. There were no admissions in January and February, and only one in March. The largest number of cases occurred in May.

In the Madras and Bombay Presidencies, typhoid, as shown by the table, is most prevalent in the rainy season, and some of the medical officers, for example Surgeon-Lieutenant-Colonel Quill, in charge of the Station Hospital at Kirkee, states:—"That "this connection which apparently exists between enteric fever and the rainfall ought "not to occasion surprise. For putting on one side the likelihood of heavy rain "washing surface and sub-soil impurities into the source from which the drinking-"water is derived, we know also that moisture in itself in a tropical climate aids "putrefaction, and unless at such a time the conservancy of a station is above "suspicion, putrescence of all kinds is prone to flourish."

Before any reliable statements can be made regarding the connection, if any, between season or climate and the prevalence of typhoid, it will be necessary to institute a careful comparison of the weather register with the history of the occurrence of enteric fever in individual stations. The only statement which can be made with any certainty, and for what it is worth, is, that in Bengal the incidence of typhoid fever is at a minimum in the first quarter of the year.

Bowel complaints.

During 1893 there was a lower death-rate from dysentery and diarrhœa than in 1892 (0·51 against 0·72). As in other years, dysentery was more prevalent in the Madras army than in that of either Bengal or Bombay. The admission-rates in Bengal and Madras were considerably lower than in 1892.

Hepatitis.

In all three Presidencies there was a decrease both in the admissions and deaths due to hepatitis. For the Army as a whole the admission-rate was 18 per 1,000 and the death-rate 0·92, against 19 and 1·19 respectively in 1892. As usual Madras had the highest admission-rate.

Respiratory diseases.

In all three Presidencies there was a decrease in the number of admissions for respiratory diseases. In the whole Army the admission-rate declined from 36 in 1892 to 32 per 1,000 and the death-rate rose from 0·83 to 0·93. The admission and death-rates from pneumonia were 3·4 and 0·70 per 1,000 against 3·5 and 0·62 in 1892. As usual the highest mortality from pneumonia occurred in the Indus Valley and North-Western Rajputana and Hill stations.

Venereal diseases.

In the great majority of stations there was an increased prevalence of venereal diseases. For example, in 42 of the 63 military stations of Bengal the admission-rate was increased, and the total increase for this Presidency amounted to 49·9 per 1,000 of strength. In other words, whereas in 1892 out of every 1,000 men, 412 were admitted to hospital for venereal diseases, in 1893 this number rose to 462, or almost to half the strength of the Army. There was an increase in 16 of the 26 military stations of the Madras command, including Burma. In 1892 the admission-rate for these diseases was 415 per 1,000, while in 1893 it rose to 480 per 1,000. There was an increase in 14 of the 22 military stations in the Bombay Presidency. In 1892 the admission-rate for these diseases was 396 per 1,000, and this rose to 463 in 1893.

The admission-rate per 1,000 in all India during 1892 was 409·9, and this rose in 1893 to 466·0. The average number constantly sick from venereal diseases was 29·99 per 1,000 in 1892, but in 1893 this rose to 37·49. The rise in the admission-rate was general throughout the three Presidencies, as shown by the following table:—

Admissions from Venereal Diseases in the three Presidencies.

Presidency.	Admissions per 1,000.												
	1870–79.	1881–90.	1882–91.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.
Bengal* - -	209	366	377	291	363	394	356	373	491	504	395	412	462
Madras - -	198	367	380	307	350	394	400	376	452	491	402	415	480
Bombay* - -	191	339	354	292	272	370	337	357	481	515	417	396	463
India† - -	203	360	374	294	343	389	361	371	482	504	401	410	466

* Excluding troops in Afghanistan during 1881. † Including troops in Afghanistan during 1881.

The year 1884 was the last in which the Contagious Diseases Acts were in full force. The following table compares the venereal statistics of 1884, 1892, and 1893:—

ARMY OF INDIA.

Venereal Admissions of 1884, 1892, *and* 1893 *compared.*

VENEREAL DISEASES.	1884.* Strength 55,349.		1892. Strength 68,137.		1893. Strength 70,091.	
	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.
Primary syphilis	4,992	90·2	6,991	102·6 } 161·1	9,064	129·3 } 213·6
Ulcer of penis	—	—	3,987	58·5 }	5,909	84·3 }
Secondary syphilis	1,352	24·4	3,940	57·8	4,316	61·6
Gonorrhœa	8,070	145·8 } 179·0	10,829	158·9 } 190·9	12,784	182·4 } 190·8
Other venereal diseases	1,835	33·2 }	2,180	32·0 }	590	8·4 }
Total	16,249	293·6	27,927	409·9	32,663	466·0

* From Annual Returns.

In the Army of Bengal venereal diseases caused 31·5 per cent. of all admissions, and 12 per cent. of the invaliding; in the Army of Madras they caused 39 per cent. of all admissions, and 31 per cent. of the invaliding; and in the Army of Bombay they caused 32 per cent. of all admissions, and 10 per cent. of the invaliding.

Again and again medical officers insist upon the after-effects of venereal diseases subsequent to the men's discharge from hospital. They speak of permanently impaired health, and remark very truly that a large number of these men, although able after a fashion to get through their garrison duties, would inevitably break down under the conditions of active service, and become an encumbrance to the force. A man who has had constitutional syphilis feels the effect of it for years: indeed some authorities on this subject go so far as to state that syphilis is never eradicated from the system. However this may be, in the case of our short-service army, one may reasonably expect that a man who has once contracted constitutional syphilis is not likely to be equal to the rigours of a prolonged campaign during his future service.

Some idea can be formed of the amount of non-efficiency due to this cause when it is considered that throughout the European army in India during 1893, there were, excluding the 590 cases of "other" venereal diseases and the 15 cases of venereal diseases amongst troops on field service (because in neither of these can the average duration be stated), 32,058 cases of venereal disease, each of which remained in hospital for an average of 29·82 days, amounting to a total loss of service of 956,110 days. During 1893 there were 2,619 men, or the strength of nearly three regiments, constantly in hospital for venereal diseases.

Invaliding.

In the whole European army of India 1,769 men were invalided, being 25·25 per 1,000 of strength; the corresponding numbers for 1892 were 1,661 and 24·37 per 1,000. Hence there was not much variation in the total number invalided, although there was considerable variation in the causes of invaliding. The proportion of invalids to strength was, as also in 1892, lowest in Bombay, highest in Madras.

Thirty-nine per cent. of the total number invalided were discharged as unfit for further service. This proportion, as may be seen from the following table, was rather higher than in the years 1889 to 1891.

Percentage of those Invalided for Discharge to Total Number Invalided.

—	1889.	1890.	1891.	1892.	1893.
Army of India	37	35	34	40	39
„ Bengal	37	33	34	40	41
„ Madras	46	43	36	36	32
„ Bombay	25	32	33	45	40

In Bengal the proportion discharged from the service was greater than in 1892, but in both Madras and Bombay it was less.

In the following table the ratios of admission, death, and invaliding in the three armies are given side by side :—

Admission, Death, and Invaliding Rates in the three Presidencies.

Year.	Bengal.*			Madras.			Bombay.*		
	Admissions per 1,000.	Deaths per 1,000.	Invaliding per 1,000.†	Admissions per 1,000.	Deaths per 1,000.	Invaliding per 1,000.†	Admissions per 1,000.	Deaths per 1,000.	Invaliding per 1,000.†
1879–79 -	1,522	21·00	41·40	1,264	17·69	48·71	1,533	15·27	42·79
1881–90 -	1,552	14·48	25·89	1,257	12·99	27·59	1,431	13·90	32·00
1890 - -	1,584	15·50	25·05	1,442	12·84	22·68	1,396	9·56	28·87
1891 - -	1,394	16·86	24·64	1,304	14·49	31·28	1,409	14·24	28·98
1892 - -	1,582	19·81	22·57	1,236	12·32	33·05	1,593	12·90	21·33
1893 - -	1,466	14·35	25·99	1,230	9·54	26·09	1,434	10·13	22·05

* Excluding troops in Afghanistan during 1881. † Calculated on the strength derived from annual returns.

The following extract shows the diseases which caused invaliding of not less than 1 per 1,000 of strength. The number invalided on account of venereal diseases shows a marked increase; in 1892 it was 208, but in 1893 it was 277, the corresponding ratios per 1,000 being 3·05 and 3·95 respectively. Of those invalided from this cause, 38·6 per cent. were discharged as unfit for further service; whereas of those invalided on account of malarial fevers and debility, only 6 and 10 per cent., respectively, were discharged as unfit for further service.

Bengal.		Madras.		Bombay.	
Diseases.	Invaliding Rates.	Diseases.	Invaliding Rates.	Diseases.	Invaliding Rates.
Malarial fevers - -	3·57	Syphilis and gonorrhœa -	8·05	Debility - - -	4·00
Debility - - -	3·41	Debility - - -	2·46	Malarial fevers - -	2·96
Syphilis and gonorrhœa -	3·20	Circulatory diseases - -	2·01	Circulatory diseases - -	2·37
Circulatory diseases - -	3·08	Malarial fevers - -	1·42	Syphilis and gonorrhœa -	2·29
Tubercle of the lungs -	1·18	Anæmia - - -	1·27	Other nervous diseases -	1·11
Other nervous diseases -	1·16	Hepatic diseases - -	1·27	Mental diseases - -	1·11
Mental diseases - -	1·14	Dysentery - - -	1·12		

There was a decrease in the ratio of invaliding from mental diseases in the army of India (from 1·30 to 1·10), in Bengal (from 1·35 to 1·14), and Madras (from 1·86 to 0·97), while that for Bombay (1·11) remained stationary. There were 33 cases of melancholia, 26 of dementia, and 15 of mania.

The percentage of men who were invalided while under 25 years of age, to the whole number invalided, was 57·43 for the Army of India, against 53·41 for 1892. The percentage of men under 25 in the same army was 53 against 51 in 1892.

Of the total number of men invalided, 35 per cent. were of less than two years' service, and 80 per cent. were of less than five years' service. But it must be remembered that 79 per cent. of all the men in the army in 1893 were of less than five years' service.

The percentage ratio of invalids who had less than four years of Indian service to the total number of invalids was 68 in 1893, against 65 in 1892, and 68 in the five-year period 1886–1890. Of the men invalided with less than four years of Indian service in 1893, 75 per cent. were also under 25 years of age.

The following table shows the results of a tour of Indian service upon the strength of the corps enumerated. Out of 872 men in the 2nd Somersetshire Regiment who came to India 16 years before, only 8 returned to England with it. Of the 864 to be accounted for, 66 had died, 114 had been invalided, and the remainder had been either transferred to other regiments or discharged from service :—

Regiments and Batteries.	Years in India.	Strength.			Causes of Loss.			Loss per 1,000 of Strength.	Loss per 1,000 from the different Causes.		
		Present on arrival in India.	Embarked for England.	To be accounted for.	Deaths.	Invaliding.	Other Causes.		Deaths.	Invaliding.	Other Causes.
T. Battery, R.H.A.	15	155	1	156	14	38	104	993·63	89·17	242·04	662·42
19th Field Battery, R.A.	14	147	7	140	17	26	97	952·38	115·65	176·87	659·86
20th „	14	161	1	160	7	15	138	993·79	43·48	93·17	857·14
76th „	14	104	9	95	3	5	87	913·46	28·85	48·08	836·54
2nd Somersetshire Regiment	16	872	8	864	66	114	684	990·83	75·69	130·73	784·40
2nd South Wales Borderers	13	870	7	863	41	81	741	991·95	47·13	93·10	851·72

Statistics regarding Women.

The average number of women remaining the same, the admission and death-rates fell considerably, and showed a great improvement upon those of 1892, which were unusually high.

The chief causes of admission were debility, ague, and the diseases peculiar to women. Among the chief diseases which caused increased admissions, were tubercle of the lungs, enteric, and other fevers, and diarrhœa. In the Bengal Presidency the admission-rate from all causes was 797 3 per 1,000, in Madras 712·6, and in Bombay 865·3, both Bengal and Madras showing a marked decrease compared with the previous year, while Bombay shows a slight increase. The highest admission-rate for debility occurred in Madras. In Bombay, the highest for ague, and in Bengal the highest for enteric fever. The constantly sick-rate was highest in Bengal and lowest in Madras.

The death-rate also shows an improvement in the health of the soldiers' wives as compared with 1892. The chief causes of death were enteric fever, puerperal fever, child-birth, and remittent fever. There was a slightly increased mortality from enteric, puerperal, and other fevers, but a marked decrease in the number of deaths from cholera, pneumonia, and dysentery. In the Bengal Presidency the death-rate was 16·26 per 1,000, in Madras 7·66, and in Bombay 15·85. The rates for Bengal and Madras are lower than those for 1892, but the Bombay rate is higher. Bengal had the highest death-rate from child-birth, puerperal, and enteric fevers, Madras the highest for tubercle, and Bombay the highest for dysentery.

Strength, Sickness and Mortality of Women in the Army of India.

Years.	Strength.	Admission-rate per 1,000.	Constantly sick-rate per 1,000.	Death-rate per 1,000.
1881–90	33,517	837·5	30·6	18·86
1882–91	32,913	812·1	29·8	17·59
1891	3,137	748·8	27·1	14·03
1892	3,101	904·2	35·8	19·03
1893	3,135	790·1	33·2	14·04

Statistics regarding Children.

The decrease in the average number of children continued. There was a decline in the admission and death-rates, but a slight increase in the number constantly sick.

Strength, Sickness and Mortality of Children in the Army of India.

Years.	Strength.	Admission-rate per 1,000.	Constantly sick-rate per 1,000.	Death-rate per 1,000.
1881–90	62,862	633·5	23·4	50·22
1882–91	62,200	609·4	22·2	50·63
1891	5,886	509·0	19·2	49·27
1892	5,762	564·6	22·0	48·59
1893	5,662	554·9	24·2	39·03

The chief causes of admission were ague, respiratory diseases, debility, diarrhœa, and dysentery. The chief increase of admission was in whooping-cough and other respiratory diseases; the chief decrease in influenza, measles, and simple continued fever. In Bengal the admission-rate was 557·8, in Madras 544·3, and in Bombay 560·8.

The mortality is the lowest of which I can find any record. The causes of death were in order, convulsions, debility, diarrhœa, and teething. There was increased mortality from whooping-cough and ague, but a much decreased death-rate from diphtheria, simple continued, and remittent fevers. In the Bengal Presidency the death-rate was 43·41, in Madras 37·34, and in Bombay 29·51. Madras was the only Presidency in which the death-rate was higher than in the previous year.

Deaths among Officers of the Army of India.

There were 6,382 officers on the strength of the army in India on the 1st July 1893; this number includes those absent on leave out of, as well as those present, in India. The death-rate of officers of the British service was 10·67 per 1,000, and of the Indian service 8·82. This difference is due to the larger number of deaths from enteric fever among the former, the respective numbers being 11 and 1, and the explanation of this difference lies no doubt in the fact that officers do not join the Indian service until they have served for a year or two with a British regiment in India.

Native Troops.

Sickness and mortality in 1893.

The year 1893 was one of the most healthy in the history of the Native Army of India. The cholera mortality was the lowest on record.

Sickness and Mortality of the periods 1877–81, 1881–90, *and* 1882–91, *and of the years* 1891, 1892, *and* 1893.

Year.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		Mortality, including absent Deaths.
				Cholera.	All Causes.	
1877–81 -	118,669	1,422	48	1·94	24·90	27·40
1881–90 - -	116,712	1,054	35	1·28	13·44	16·91
1882–91 - -	118,111	1,020	34	1·45	13·09	16·61
1891 - -	128,600	972	35	2·64	15·44	19·34
1892 - -	127,355	1,092	37	2·14	14·97	18·67
1893 - -	127,091	862	32	·20	10·29	12·81

The chief causes of admission were ague, diseases of the integuments, injuries, and respiratory diseases. Among diseases with increased admission rates were simple continued fever, respiratory, and skin diseases. Among those with lessened rates were influenza, cholera, dysentery, and diarrhœa, and especially ague, which caused only 38 per cent. of the total admissions, as compared with 48 per cent. in the previous year.

The chief causes of death were pneumonia and other respiratory diseases, remittent and intermittent fevers. Among the diseases in which mortality was lessened were cholera, malarial fevers, and pneumonia. The number of cases of suicide rose from 9 to 22, or from ·07 to ·17 per 1,000 of strength. The chief causes of invaliding were debility, rheumatism, malarial fevers, and respiratory diseases.

The Native troops suffered much less than Europeans from enteric fever, heat-stroke, and venereal diseases; while, on the other hand, the Europeans suffered less from influenza, pneumonia, other respiratory diseases, dysentery, and scurvy.

Bengal Army.

The sickness of the Native army of Bengal was the lowest on record, as shown by the number of admissions to hospital, the number constantly sick, and the deaths.

Sickness and Mortality of the ten-year periods, 1867–76, 1881–90, *and* 1882–91, *and of the years* 1891, 1892, *and* 1893.

Year.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		Mortality, including absent Deaths.
				Cholera.	All Causes.	
1867–76 *	39,508	1,360	42	2·12	13·84	17·25
1881–90	55,244	1,200	38	1·15	14·27	18·22
1882–91	56,963	1,150	37	1·49	13·91	17·71
1891 †	66,230	1,021	35	3·73	17·32	18·06
1892 ‡	65,594	1,234	40	2·58	16·53	19·70
1893	65,132	861	32	·05	11·96	14·42

* Excluding Punjab Frontier Force. † Excluding certain men on escort duty.
‡ Excluding certain men at Panjgur and on march.

The chief causes of admission were ague, diseases of the integuments, injuries, and respiratory diseases. Among the diseases with increased admission rates were respiratory diseases, rheumatism, and skin diseases. Among those with lessened rates were influenza, cholera, ague, dysentery, and diarrhœa. Ague caused 36 per cent. of the total admissions, against 51 per cent. in 1892.

The chief causes of death were pneumonia, remittent fever, and other respiratory diseases. The only diseases with slightly increased death-rates were spleen, urinary, "other" respiratory diseases, and hepatic congestion. Among those from which mortality was lessened were cholera, small-pox, ague, and pneumonia. Pneumonia caused 33 per cent. of the total deaths, and other respiratory diseases 13 per cent.

The chief causes of invaliding were debility, rheumatism, and the after-effects of malarial fevers.

Corps of Central India and Rajputana.

There was a great improvement in the vital statistics of the corps in Central India and Rajputana.

Sickness and Mortality of the ten-year periods 1881–90 *and* 1882–91, *and of the years* 1891, 1892, *and* 1893.

Year.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		Mortality including absent Deaths.
				Cholera.	All Causes.	
1881–90	5,161	709	21	·43	8·27	9·46
1882–91	5,175	690	20	·48	7·85	9·03
1891	5,175	629	20	·58	7·73	8·96
1892	5,128	777	21	2·54	9·56	10·50
1893	5,174	660	18	—	5·99	6·62

The chief causes of admission were ague, diseases of the integuments, and injuries. Among the diseases with raised admission rates were small-pox, respiratory and eye disease, guineaworm, and skin diseases. Among those with lessened admission rates were malarial and simple continued fevers, influenza, cholera, dysentery, and diarrhœa. Ague caused 43 per cent. of the total admissions.

The chief causes of death were remittent fever and pneumonia. Among the diseases with increased mortality were remittent fever, circulatory diseases, and injuries. Among those with lessened mortality were cholera, ague, and pneumonia. Remittent fever caused 29 per cent. of the total deaths.

Madras.

The health of the native army of Madras showed a very marked improvement.

Sickness and Mortality of the ten-year periods 1881–90, *and* 1882–91, *and of the years* 1891, 1892, *and* 1893.

Year.	Average Strength.	Ratio per 1,000.				Mortality, including absent Deaths.
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	All Causes.	
1881–90 - -	25,960	835	33	1·98	12·99	27·87
1882–91 - -	25,715	836	34	2·05	13·81	18·94
1891 - - -	26,088	1,017	46	1·99	20·05	27·32
1892 - -	25,963	868	38	2·27	18·53	26·00
1893 - - -	26,179	743	34	·69	12·19	15·43

The chief causes of admission were ague, diseases of the integuments, injuries, and dysentery. Among the diseases with raised admission rates were simple continued fever and respiratory diseases other than pneumonia. Among those with lessened admission rates were influenza, cholera, ague, dysentery, and diarrhœa. Ague caused 32 per cent. of the total admissions.

The chief causes of death were pneumonia, ague, anæmia, and debility, injuries, remittent fever, and cholera. Among the diseases which caused increased mortality were enteric fever, circulatory and urinary diseases. The number of cases of suicide rose from one to five. Among the diseases from which mortality was lessened were cholera, dysentery, diarrhœa, and pneumonia. Respiratory diseases caused 19 per cent., ague and remittent fever also 19 per cent., and anæmia 12 per cent. of the total deaths.

The chief causes of invaliding were debility and malarial fevers.

The following table shows the statistics of all the troops serving in Burma and the Andamans. Of these troops the Madras Army furnished in 1893 about 96 per cent. :—

Year.	Average Strength.	Ratio per 1,000 of Strength.			
		Admissions into Hospital.	Constantly Sick.	Deaths from	
				Cholera.	All Causes.
1892 - -	11,333	1,349	57	2·29	29·12
1893 - -	10,326	1,092	48	·87	19·85

The health of the native army of Bombay showed a distinct improvement during 1893. **Bombay.**

Sickness and Mortality of the ten-year periods 1881–90 *and* 1882–91, *and of the years* 1891, 1892, *and* 1893.

Year.	Average Strength.	Ratio per 1,000.				Mortality, including absent Deaths.
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	All Causes.	
1881–90 - -	23,140	1,151	38	1·12	14·58	16·74
1882–91 - -	23,024	1,098	36	1·11	12·88	15·35
1891* - - -	23,780	978	31	1·26	9·63	12·34
1892* - -	23,355	1,130	34	·81	10·10	12·48
1893 - - -	23,626	1,121	33	·08	6·60	8·84

* Excluding certain men on escort duty.

The chief causes of admission were ague, diseases of the integuments, injuries, and respiratory diseases. Among the diseases with raised admission rates were simple continued fever, other fevers, respiratory and skin diseases. Among those with lessened rates were influenza, cholera, ague, dysentery, and diarrhœa. Ague caused 47 per cent. of the total admissions.

The chief cause of death was pneumonia. Among diseases which caused a larger number of deaths than in 1892 were ague and circulatory diseases. The number of cases of suicide rose from one to four. Among the diseases with lessened mortality were cholera, remittent fever, and pneumonia, which caused 21 per cent. of the total deaths.

The chief causes of invaliding were debility, respiratory, and rheumatic diseases.

Hyderabad Contingent.

The health of the Hyderabad Contingent shared in the improvement which characterised the year throughout India.

Sickness and Mortality of the ten-year periods 1881–90 *and* 1882–91, *and of the years* 1891, 1892, *and* 1893.

Year.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly sick.	Deaths from		Mortality including absent deaths.
				Cholera.	All causes.	
1881–90 - -	6,673	590	20	·78	6·28	8·11
1882–91 - -	6,672	575	20	·84	6·10	8·04
1891 - - -	7,063	529	19	1·13	6·09	7·83
1892 - -	7,058	681	22	1·70	7·08	8·35
1893 - - -	6,989	589	20	·29	3·29	3·94

The chief causes of admission were ague, diseases of the integuments, and injuries. Among the diseases with raised admission rates were ague and eye diseases. Among those with lessened rates were influenza, cholera, simple continued fever, and injuries. Ague caused 45 per cent. of the total admissions.

The chief causes of death were respiratory diseases and injuries. Among the diseases which caused increased mortality were ague and tubercle of the lungs. Among those with lessened rates were cholera, circulatory diseases, and pneumonia. Respiratory diseases caused 35 per cent. of the total deaths.

Comparison of Corps.

Having considered individually the health statistics of the several portions of the Native army, it will now be convenient to contrast the main features of the same; and for ready reference the chief results are brought together in the following table :—

Corps.	Total Deaths per 1,000, including Absentees.	Average Strength present.	Ratio per 1,000.			
			Admissions into Hospital.	Constantly Sick.	Deaths from Cholera.	Present Deaths from all Causes.
India - - -	12·81	127,091	862	32	·20	10·29
Bengal Army - - -	14·42	65,132	861	32	·05	11·96
Corps of Central India and Rajputana	6·62	5,174	660	18	—	5·99
Madras Army - - -	15·43	26,170	743	34	·69	12·19
Bombay Army - - - -	8·84	23,626	1,121	33	·08	6·60
Hyderabad Contingent - -	3·94	6,989	589	20	·29	3·29

As usual, the health of the Hyderabad contingent and of the Corps of Central India and Rajputana was the best. Sickness and mortality were greatest in the Madras Army.

The following table facilitates a comparison of the sick and death-rates in the different groups :— Geographical groups of India.

		Ratio per 1,000 of Strength.												
		I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.
		Burma Coast and Bay Islands.	Burma Inland.	Assam.	Bengal and Orissa.	Gangetic Plain and Chutia Nagpur.	Upper Sub-Himalayan.	Indus Valley and North - Western Rajputana.	South - East Rajputana, Central India, and Gujarat.	Deccan.	Western Coast.	Southern India.	Hill Stations.	India.
1892	Constantly sick rate	75·4	57·4	72·4	57·2	28·8	36·6	45·2	29·5	28·3	23·7	26·8	45·0	36·7
	Death-rates from—													
	Cholera	—	2·52	·80	—	2·10	2·48	3·24	1·43	·89	—	3·75	3·04	2·14
	Respiratory diseases	2·81	3·08	3·18	·68	1·95	6·67	9·22	2·36	2·04	1·38	2·54	5·59	4·27
1893	Constantly sick rate	33·4	55.8	50·7	48·4	28·0	29·9	38·5	26·6	26·4	23·7	26·3	37·8	31·7
	Death-rates from—													
	Cholera	—	·43	·40	—	—	·12	—	—	·25	—	·34	—	·20
	Respiratory diseases	·96	3·31	3·56	·34	1·16	6·19	9·60	1·14	1·27	1·34	1·95	5·09	3·80

The highest constantly sick rate was that of the Burma Inland group, the lowest was that of the Western Coast. The highest admission rate was that of Burma Inland, the lowest that of Southern India. For ague the highest admission rate was in the Hill stations, so also for remittent fever. For simple continued fever the highest admission rate was on the Western Coast, for nervous diseases on the Burma Coast, for pneumonia in the Indus Valley, for dysentery in Assam, for spleen diseases in the Indus Valley, for rheumatism in the Bengal and Orissa, and for venereal diseases the Burma Coast group showed the highest admission rate.

The highest death rate was that of Burma Inland, and the lowest that of Western Coast. From ague the highest mortality was in Burma Inland, from remittent fever and from respiratory diseases in the Indus Valley, from dysentery in the Burma Coast, and from anæmia in the two Burma groups.

Of the large stations throughout India, with a strength of not less than 1,000, 18 returned death-rates higher than those of the army or corps to which they belonged.

The total number of cases of influenza fell from 1,795 in 1892 to 784 in 1893. Until December there were comparatively few cases, but in that month, just as in 1891, there was a revival of the epidemic, there being 404 cases, of which 332 were in two hill stations, viz., 170 at Lansdowne and 162 at Quetta. Principal diseases: Influenza.

The following table shows that Native troops and prisoners suffered much more from influenza than did European troops; it also shows in all three bodies a lessened admission and death-rate from all causes :—

	Per 1,000 of Average Strength.											
			Increase or Decrease as compared with 1892.									
	Influenza.		Pneumonia.		Other Respiratory Diseases.		Simple continued Fever.		Ague.		All causes.	
	Admission.	Death.	Admission.	Death.	Admission.	Death.	Admission.	Death.	Admission.	Death.	Admission.	Death.
European Troops	·3	—	— ·1	+ ·08	— 3·9	+ ·02	—33·0	—·04	— 64·6	—·08	—102·4	— 4·46
Native Troops	6·2	·20	—1·3	— ·51	+10·5	+ ·04	+ 1·9	—·03	—194·5	—·26	—230·3	— 4·68
Prisoners	6·4	·09	—2·5	—1·61	+ 8·3	— ·09	— 8·7	+·02	—122·8	—·27	—218·4	—11·82

There were only 41 cases of cholera throughout India, of which 25 were admitted in November and December. There was not a single case in February, March, June, and July. Cholera.

Fevers.

Malarial fevers still constitute a very large proportion of the sickness in the Native army; there were 43,529 admissions on account of these fevers, as against 68,665 in the previous year; their fatality, however, bears a very small proportion to the number of cases treated, being only 51 per cent. The period of greatest prevalence was, as usual, the end of the rainy and beginning of the cold season, from August to November inclusive.

Only 34 cases were admitted as enteric fever, 16 of which occurred in Assam. The following table shows the very unequal incidence of enteric fever upon Europeans and Natives in India:—

Admission and Death Rates per 1,000 *from Enteric Fever in the European Troops, Native Troops, and Jails of India compared.*

	1882 to 1891.		1893.	
	Admissions.	Deaths.	Admissions.	Deaths.
European troops	14·7	4·13	20·0	5·29
Native troops	·3	·09	·3	·04
Jail population	·2	·10	·3	·16

Post-mortem examinations are rarely made in the case of Native soldiers, but in the case of prisoners they are seldom omitted, and as the ratios amongst these are almost identical with those for Native troops, there can be no doubt that the latter are less liable than Europeans to enteric fever. The following table shows that the fever mortality in the European and Native armies is not the same in amount:—

Fever Mortality of Native Troops compared with that of European Troops in 1893.

Causes of Death.	Died per 1,000 of Average Strength.		Relative Liability in Percentages.			Percentage in Deaths from all Causes.	
	European Troops.	Native Troops.	European Troops.	Native Troops.	Total=100.	European Troops.	Native Troops.
Ague	·20	·72	21·7	78·3	100	1·6	7·0
Remittent fever	·50	1·13	30·7	69·3	100	4·0	11·0
Simple continued fever	—	·02	—	100·0	100	—	·2
Enteric fever	5·29	·04	99·2	·8	100	42·0	·4
Total	5·99	1·91	75·8	24·2	100	47·6	18·6

Dysentery.

From dysentery the admission and death rates were lower than in the preceding year, the former by 20, the latter by ·49 per 1,000. The highest admission rate was that of Assam, the lowest that of Southern India. Burma showed the highest death-rate. The death-rate of European troops from dysentery was slightly higher than that of the Native troops, the respective ratios per 1,000 being ·51 and ·47; on the other hand, dysentery caused only 4·1 per cent. of all the deaths of European soldiers, compared with 4·6 among Native soldiers. Hence, at present, it would appear that the two races suffer about equally from dysentery.

Respiratory diseases.

The following table shows the ratios of admission from respiratory diseases in the principal groups of the Native Army:—

Period.	Ratio of Admission per 1,000 of Strength.					
	India.	Bengal.	Corps of Central India and Rajputana.	Madras.	Bombay.	Hyderabad Contingent.
1881–85	56	56	38	27	91	25
1886–91	47	51	34	27	65	23
1891	50	61	32	36	50	20
1892	53	66	37	37	44	35
1893	62	78	43	41	55	32

Except in the Hyderabad Contingent, the ratios were higher than in the previous year. The geographical groups in which respiratory diseases were specially prevalent are Assam and the Indus Valley. As respiratory diseases are the chief cause of death in the Native army, the following table is given of the death-rates from this cause in recent years:—

Period.	Ratio per 1,000 of Strength. Deaths from Respiratory Diseases.					
	India.	Bengal.	Corps of Central India and Rajputana.	Madras.	Bombay.	Hyderabad Contingent.
1881–85	4·24	4·15	3·37	1·53	6·73	1·40
1886–91	3·41	4·25	2·72	1·60	3·80	1·52
1891	3·56	4·63	3·29	2·07	2·74	1·98
1892	4·27	5·51	2·93	2·74	3·51	1·99
1893	3·80	5·48	1·74	2·33	2·03	1·15

The following table gives the admission and death rates per 1,000 from pneumonia in 1893, and shows on the whole an improvement :—

Admission and Death-rates per 1,000 *from Pneumonia in the different Corps of the Native Army.*

Period	India.		Bengal.		Corps of Central India and Rajputana.		Madras.		Bombay.		Hyderabad Contingent.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
1892	13·6	3·26	17·4	4·18	11·9	2·34	9·3	2·16	9·5	2·65	9·2	1·56
1893	12·3	2·75	16·	3·98	12·0	1·55	6·4	1·68	8·4	1·40	5·9	·72

The next table shows the death-rates from pneumonia in the different geographical groups:—

Deaths from Pneumonia.

	Groups.												
	Burma Coast and Bay Islands.	Burma Inland.	Assam.	Bengal and Orissa.	Gangetic Plain and Chutia Nagpur.	Upper Sub-Himalayan.	Indus Valley and N. W. Rajputana.	S. E. Rajputana, Central India and Gujarat.	Deccan.	Western Coast.	Southern India.	Hill Stations.	Army of India.
Death-rates per 1,000 of average annual strength.	·48	2·16	1·98	·34	1·16	4·41	7·52	·99	·76	·67	1·49	3·50	2·75
Percentages in total deaths.	4·3	11·8	20·0	4·5	24·2	36·5	44·3	17·8	16·1	14·3	18·6	24·7	26·7

Pneumonia is most prevalent and most fatal in the north and north-west of India. As shown by the following figures, for each death from pneumonia amongst European troops, there were about four amongst the same strength of Native troops:—

Cause of Death.	Died per 1,000 of Average Strength.		Relative Liability in Percentages.			Percentages in Deaths from all Causes.	
	European Troops.	Native Troops.	European Troops.	Native Troops.	Total 100.	European Troops.	Native Troops.
Pneumonia	·70	2·75	20·3	79·7	100	5·5	25·7

Venereal diseases.

The following statements regarding venereal diseases are given to correspond with those in Section II. for European troops. The first shows a lessened admission-rate for every province in India :—

Venereal Disease in the Native Army of India.

Corps.	Admissions per 1,000 of Strength.		
	1884.	1892.	1893.
Bengal Army	31·3	37·5	32·3
Corps of Central India and Rajputana	18·1	17·4	15·3
Madras Army	22·6	45·5	43·9
Bombay Army	32·1	49·6	49·4
Hyderabad Contingent	16·4	21·1	17·3
India	27·9	39·6	36·4

Venereal Diseases.	1884.*		1892.		1893.	
	Strength 127,477.		Strength 127,355.		Strength 127,091.	
	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.
Primary syphilis	1,266	9·9 } 9·9	1,166	9·2 } 14·1	1,129	8·9 } 13·3
Ulcer of penis	—	— }	635	5·0 }	559	4·4 }
Secondary syphilis	609	4·8	1,001	7·9	1150	9·0
Gonorrhœa	959	7·5 } 10·1	1,440	11·3 } 17·6	1,424	11·2 } 14·0
Other venereal diseases	333	2·6 }	800	6·3 }	358	2·8 }
Total	3,167	24·8	5,042	39·6	4,620	36·4

* From Annual Returns.

The third statement compares the venereal admission-rates of the European and Native armies, and shows how very much more prevalent these diseases are amongst the former. It is remarkable that while these diseases are becoming more prevalent amongst European troops, this is not the case with Native troops.

A Comparative Summary of Venereal Diseases in the European and Native Armies.

	1884.				1892.				1893.			
	European Troops.		Native Troops.		European Troops.		Native Troops.		European Troops.		Native Troops.	
	Admissions.	Ratio per 1,000.	Admissions.	Ratio per 1,000.	Admissions.	Ratio per 1,000.	Admissions.	Ratio per 1,000.	Admissions.	Ratio per 1,000.	Admissions.	Ratio per 1,000.
Army of Bengal	9,731	290·6	1,608	31·3	17,403	412·4	2,458	37·5	19,947	462·3	2,104	32·3
Army of Madras	3,308	306·7	635	22·6	5,489	415·0	1,182	45·5	6,448	480·5	1,149	43·9
Army of Bombay	3,127	291·6	750	32·1	5,035	396·1	1,159	49·6	6,268	463·5	1,167	49·4
Army of India	16,166	293·9	3,200	27·9	27,927	409·9	5,042	39·6	32,663	466·0	4,620	36·4

The fourth statement shows that amongst both European and Native troops there was an increase of constitutional syphilis :—

Comparison of the Secondary Syphilis Ratios of the European and Native Armies.

——	1884.	1892.	1893.
European troops - -	24·4	57·8	61·6
Native troops - - -	4·8	7·9	9·0

Jails.

There was a decrease, as shown in the subjoined table, of the average jail population in 1893. There was also less sickness and mortality than in any of the twenty preceding years. Sickness and mortality in 1893.

Statement showing the Sickness and Mortality among the Prisoners of India during 1881–90, 1882–91, 1891, 1892, *and* 1893.

Year.	Average Annual Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	Dysentery and Diarrhœa.	All Causes.
1881–90 - -	89,978	1,113	39	2·91	11·72	34·96
1882-91 - -	89,642	1,093	38	2·91	10·77	33·61
1891 - - -	101,019	1,043	37	3·09	8·42	31·89
1892* - -	103,159	1,186	41	4·73	9·77	36·83
1893† - - -	101,737	967	37	0·83	6·71	25·01
* Including the subsidiary jails 106,739		1,180	41	—	—	36·43
† Including the subsidiary jails 106,015		964	37	—	—	24·73

The chief causes of sickness were malarial fever (39 per cent. of all admissions), dysentery and diarrhœa (15 per cent. of all admissions), abscess and boil (9 per cent. of all admissions), respiratory diseases (7 per cent. of all admissions). Compared with 1892, the admission rate from respiratory diseases including tubercle rose from 64 to 71 per 1,000, while those from influenza and cholera fell from 57 and 9 respectively to 6 and 2 per 1,000. The admission-rate from dysentery and diarrhœa fell from 174 per 1,000 to 143. As dysentery and diarrhœa are the diseases from which prisoners are specially liable to suffer, a fall in the admission-rate from these may be taken to indicate an improvement in the health and surroundings of the jail population.

The number of deaths fell from 3,799 in 1892 to 2,544 in 1893, or from 36·8 to 25 per 1,000. I can find no record of an equally low death-rate for the jails of India in any former year. Statistics for the jails of all India appear for the first time in the Annual Report of the Sanitary Commissioner with the Government of India in the year 1877, and in that year the mortality was 61·95 per 1,000, about two-and-a-half times as great as in 1893. At that time the deaths from dysentery and diarrhœa alone amounted to 25·80 per 1,000 of the jail population, whereas now, the mortality from these is only 6·7 per 1,000. The year 1893 was the healthiest in the history of jails in India.

The following statement shows for each administration the proportion of prisoners in 10,000 of the population :—

Ratio of Prisoners per 10,000 *of Population in each of nine Administrations for* 1892 *and* 1893. (*Andamans excluded.*)

Administrations.	Period.	General Population, according to Census of 1891.	Prisoners.		
			Average Number.*	Proportion per 10,000 of Population.	Deaths per 1,000 of Average Strength.*
Burma	1892	7,605,560	11,844	15·0	33·10
	1893		11,767	15·5	24·56
Assam	1892	5,476,833	1,290	2·4	58·91
	1893		1,320	2·4	46·97
Bengal	1892	71,346,987	17,178	2·4	37·32
	1893		17,719	2·5	32·34
N.-W. Provinces and Oudh	1892	46,905,085	27,505	5·7	29·19
	1893		26,619	5·6	17·17
Punjab	1892	20,866,847	12,853	6·2	30·19
	1893		12,894	6·2	26·21
Bombay	1892	18,901,123	7,552	4·0	36·94
	1893		8,190	4·3	25·27
Berar	1892	2,897,491	1,224	4·2	17·16
	1893		1,358	4·7	27·98
Central Provinces	1892	10,784,294	4,716	4·4	44·95
	1893		4,419	4·1	19·01
Madras	1892	35,630,440	11,095	3·1	45·43
	1893		10,638	3·0	23·03

* Including subsidiary jails.

The following shows the proportion in which some of the principal diseases entered into the composition of a hundred deaths in each administration :—

Causes of Death.	Composition of 100 Deaths.									
	Andamans.	Burma.	Assam.	Bengal.	North-Western Provinces and Oudh.	Punjab.	Bombay.	Berar.	Central Provinces.	Madras.
Cholera	—	6·2	8·6	3·6	·2	—	11·2	—	1·2	1·0
Fevers	14·2	6·6	12·1	9·4	4·7	14·8	8·0	5·3	3·6	9·8
Pneumonia	5·5	9·0	1·7	10·5	20·5	37·5	17·1	36·8	15·5	·8
Dysentery and diarrhœa	30·5	23·5	43·1	38·8	23·2	17·2	19·3	10·5	26·2	23·2
Tubercle of the lungs	—	13·1	—	10·5	9·7	8·4	1·6	—	2·4	6·7
Anæmia and debility	18·8	3·8	12·1	1·5	8·4	—	7·0	7·9	9·5	15·6
All causes	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0

Assam had the highest mortality from cholera, malarial fevers, circulatory diseases, dysentery, diarrhœa, and debility; Burma shared with Bengal the heaviest mortality from tubercle of the lungs; Bengal had a considerable mortality from dysentery; the Punjab had the highest mortality from other fevers, and next to Berar, the highest from pneumonia.

In the Andamans the health of the prisoners showed a considerable improvement. The deaths from dysentery and diarrhœa fell from 20·19 per 1,000 in 1892 to 9·26 in 1893, and the deaths from all causes fell from 50·78 per 1,000 to 30·32. There is still, however, much sickness and mortality in this convict settlement. Of the 324 total

deaths, 99, or nearly one-third, were caused by dysentery and diarrhœa. The medical officer attributes the large amount of sickness and mortality from bowel complaints to "a defective and ill-protected water-supply."

There was a general improvement in the health of the jail population of Burma. As in former years the most prevalent diseases were malarial fevers, abscess with ulcers, dysentery, diarrhœa, eye, and respiratory diseases. The chief causes of death were dysentery and diarrhœa, tubercle of the lungs, and respiratory diseases. It is worthy of note that the daily average number sick was higher during 1893 than in 1892, although both the admissions to hospital and the deaths were much lower. I call attention to this because it shows that the nature of the sickness was of a more severe character.

There was an improvement in the health of prisoners in Assam, but the mortality, 52·49 per 1,000, is still high, being higher than the death-rate of any other province in India. The chief causes of admission were ague, diarrhœa, dysentery, abscess and ulcer, and respiratory diseases. The admission-rates from circulatory diseases and ulcers were raised; while those from ague, diarrhœa, dysentery, and almost all other causes were lowered. The chief causes of death were dysentery, diarrhœa, anæmia, fevers, and cholera. Forty-three per cent. of the total mortality was caused by dysentery and diarrhœa. The mortality from dysentery is a remarkable, but well recognised feature in the disease history of Assam, being six times that from the same cause in Bombay and Berar, and nearly four times that of the North-West Provinces, the Punjab, Central Provinces, and Madras. In the Tezpur jail the death-rate was 121·95 per 1,000, or 25 deaths in an annual average strength of 205. More than half of these deaths were caused by dysentery and diarrhœa.

The health of the jail population in Bengal showed an improvement during 1893. The chief causes of admission were, as usual, ague, dysentery, and diarrhœa. The admission rates from ague, tubercle of the lungs, and scurvy were raised, while those from dysentery, diarrhœa, influenza, and remittent fever were lowered. Ague caused 33 per cent. of the total sickness, while dysentery and diarrhœa caused 27 per cent. The chief causes of death were dysentery, tubercle of the lungs, pneumonia, and other respiratory diseases. Dysentery and diarrhœa caused 39 per cent. of the total mortality.

In the North-Western Provinces and Oudh also there was an improvement in the health of the prison population. A death-rate of only 17·23 per 1,000 is, so far as I can ascertain, unprecedented in the vital statistics of jails in India, and is in remarkable contrast to the adjoining provinces of Bengal and the Punjab, for which the corresponding rates were 32·6 and 26·6 respectively. The chief causes of admission were ague, diarrhœa, dysentery, abscess and ulcer, and respiratory diseases. Ague caused 33 per cent. of the total sickness. The chief causes of death were pneumonia and dysentery.

In the Punjab also there was an improvement in the health of its prisoners. The chief causes of admission were ague, dysentery, diarrhœa, abscess and ulcer, respiratory diseases, and fevers other than ague, such as typhus, &c. The chief causes of death were pneumonia, dysentery, tubercle of the lungs, and typhus fever. The occurrence of typhus fever is peculiar to the jails of the Punjab, there was not a single case amongst the prisoners in any other part of India, whereas in the Punjab there were 164 cases, with 25 deaths. These cases were confined to two jails, viz., Rawal Pindi and Peshawar. There can be little doubt that this disease is introduced from outside the jails, as it is not unfrequently epidemic in some of the filthy villages on both sides of the Punjab frontier, especially in the direction of Swat.

As estimated by the number of deaths, there has been a distinct improvement in the health of the jail population of Bombay, the mortality having fallen from 37·43 in 1892 to 25·64 in 1893. On the other hand, there was a slight increase in the number of admissions. The chief causes of admission were ague, diarrhœa, dysentery, respiratory diseases, abscess and ulcers, and other diseases of the skin. The admission-rates from cholera, ague, other respiratory diseases than pneumonia, diarrhœa, and skin diseases, were raised; while those from remittent and simple continued fevers, pneumonia, dysentery, and anæmia were lowered. The chief causes of death were pneumonia and other respiratory diseases, diarrhœa, dysentery, and cholera. The mortality from cholera, nervous and respiratory diseases other than pneumonia was

raised; while that from fevers, bowel complaints, and pneumonia was lowered. Respiratory diseases caused 33 per cent. of the total deaths, and bowel complaints 19 per cent.

Berar was the only administration in India, the jail population of which showed a marked deterioration in health. In 1892 also the health of these jails was indifferent; in 1893 it went from bad to worse. The chief causes of admission were ague, respiratory diseases, scurvy, and bowel complaints. There were 95 admissions for scurvy, whereas in the adjoining province of Madras, with a jail population seven times larger, there was not a single case. The admissions from pneumonia and other respiratory diseases rose from 19 per 1,000 in 1892 to 113 per 1,000 in 1893. The chief causes of death were respiratory diseases, which accounted for 50 per cent. of the total mortality, dysentery, anæmia, ague, and circulatory diseases.

The statistics for the Central Provinces show a marked improvement in the health of the prisoners. The chief causes of admission were ague, abscess and ulcers, skin diseases, respiratory diseases, diarrhœa, and dysentery. The admission-rates from respiratory diseases, spleen, and scurvy were raised; while those from ague, diarrhœa, and dysentery were lowered. A death-rate of only 19 per 1,000 is a great contrast to that of 45 per 1,000 in 1892. The chief causes of death were respiratory diseases, dysentery, anæmia, and circulatory diseases.

As in every other province of India except Berar, the health of the Madras jails showed a great improvement compared with the previous year. The mortality was less than half of that in 1892. The chief causes of admissions were ague, dysentery, diarrhœa, and debility. The admission rates from respiratory and spleen diseases were raised; while those from ague, influenza, cholera and bowel complaints were lowered. The chief causes of death were anæmia, dysentery, and respiratory diseases. The mortality from anæmia, pneumonia, and small-pox was raised; while that from cholera, dysentery, and diarrhœa was lowered. Respiratory diseases including tubercle of the lungs caused 22 per cent. of the total deaths.

General Population.

Comparison of statistics of the different provinces.

The registration of the vital statistics in India is still far from perfect. Owing to one defect or another the results are everywhere more or less understated. However, taking the figures as they are, it will be seen that the highest birth-rates were recorded in the North-Western Provinces and Oudh (40·95 per 1,000), Berar (39·3), and the Central Provinces (38·23), and the lowest in Mysore (17·72), and Coorg (21·22). In every province the number of boys born during the year was greater than the number of girls, and the excess ranged from 1·64 per cent. in Coorg, to 12·6 per cent. in the Punjab. With the exception of Assam and Coorg, the births everywhere exceeded the deaths in number, but the proportion of this excess varied from 1·93 per 1,000 in Mysore, and 4·0 in Lower Burma, to 16·85 in the North-Western Provinces and Oudh.

Excepting in Berar and Lower Burma, the numbers of deaths recorded in the various provinces were less than in 1892. The highest death-rates were recorded in Berar (32·6 per 1,000), Assam (30·28), Bengal (28·21), and the Punjab (28·13), and the lowest in Mysore (15·79), and Madras (19·3).

In the Punjab alone was the mortality among females greater than among males; in all the other provinces the male death-rate was in excess of that of females. The ratio of mortality in towns was in every case higher than in the rural circles, except in Berar and the Central Provinces; but the difference was most marked in the cases of Madras, Coorg, Lower Burma, and the Punjab, where the death-rates returned from rural circles were respectively 18·5, 24·24, 20·86, and 27·63, against 29·0, 32·43, 28·26, and 34·64 in the towns.

Turning to the principal diseases which contributed to the mortality of the year, we find that, with the single exception of Assam, cholera was everywhere less prevalent than in 1892; small-pox also was less prevalent, but its victims were more numerous in the Central Provinces, Berar, Lower Burma, and Bombay; the mortality from fevers was somewhat greater in Berar, Lower Burma, and Mysore; and dysentery and diarrhœa prevailed with greater severity only in Berar.

The following table shows the deaths recorded from all causes, month by month, in the different provinces :—

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratios of Deaths per 1,000 of Population.	
														1893.	1892.
Bengal - - -	163,441	119,344	118,003	131,426	153,366	114,487	134,129	156,491	139,255	237,186	264,958	273,377	2,005,463	28·21	31·92
Assam - - -	11,807	9,663	8,902	9,162	10,971	12,078	11,198	11,186	11,926	15,055	20,522	19,611	152,081	30·28	34·21
North-Western Provinces and Oudh.	85,837	75,281	79,713	93,850	103,542	82,346	79,066	93,793	94,738	102,675	111,175	128,201	1,130,217	24·10	34·11
Punjab - - -	61,365	46,683	39,749	33,094	43,205	39,488	34,355	42,975	47,677	57,868	65,092	66,825	578,176	28·13	49·48
Central Provinces - -	17,537	15,829	17,238	19,264	20,697	17,872	21,151	24,510	25,901	27,870	27,465	27,809	263,143	27·70	34·14
Berar - - -	4,926	4,070	4,234	5,285	5,256	4,600	5,858	10,490	11,949	13,945	11,893	10,845	92,951	32·6	28·8
Lower Burma - -	8,900	6,931	6,727	6,804	6,574	8,653	10,294	9,910	7,952	8,066	8,174	9,162	98,147	21·75	20·00
Madras Presidency -	54,955	49,411	51,546	50,418	46,834	44,521	48,798	52,340	51,388	51,748	59,844	88,279	649,782	19·3	23·3
Bombay Presidency -	39,311	35,332	36,501	42,507	41,582	37,513	42,857	53,516	44,449	46,425	45,723	46,115	511,831	27·20	32·50
Mysore - - -	6,050	6,927	8,037	8,027	6,005	5,850	6,136	6,209	5,875	5,562	5,509	6,307	76,494	15·79	16·55
Coorg - - -	397	320	274	380	298	390	469	407	385	356	301	345	4,322	24·97	30·62
Total - -	454,126	369,791	370,924	400,217	438,330	367,798	394,311	461,827	441,495	566,556	620,356	676,876	5,562,607	—	—

Compulsory registration is in force only in the towns of the province of Bengal. The system under which vital statistics are collected in rural areas by the village watchmen, and recorded by them on certain days, at the police-stations and out-posts which are the registering centres, was described in last year's report. The Sanitary Commissioner states that the scheme is working successfully. There is a further improvement in the registration of vital statistics, and the figures, although still far from perfect, are considered by the local officers to be approximately correct. The births registered in 1893 numbered 2,534,859, and were in the proportion of 35·66 to every 1,000 persons living, a higher rate by 7·60 than that recorded in 1892. The average birth rate for rural circles was 36·14 per 1,000, against 28·27 in 1892. The highest average rate, 50·66, was recorded in the rural circles of the Nadia District. In the towns the average birth-rate in 1893 was 26·27, against 23·96 in the previous year. The smaller birth-rate, recorded in the towns as compared with the rural areas, is attributed to the excess of males in the urban populations. The highest rates were recorded in Moheshpur (49·20), Meherpur (47·25), Chanduria (45·50), Lohardaga (43·17), Jamalpur (42·34), Roserha (42·06), Kushtia (41·43), and Jamui (40·02). In 25 other towns the birth-rates were between 35 and 40; in 31 between 35 and 30; and in 17 they were under 20, in two of which, Nasirabad and Jhalukati, rates lower than 10 per 1,000 were recorded. In these two towns the male population is enormously in excess of the female. The proportion per cent. of male to female births in the province was 107, varying in the different divisions from 108 in the Presidency Division and Rajshahi, to 105 in Chota-Nagpur. For the first time in the history of registration in Bengal there was an excess of births over deaths in every division; the excess was greatest in Chota-Nagpur, 13·16 per 1,000, and least in Dacca, 5·72. The highest monthly birth rates, in order, were recorded in October, November, December, and January; and in every month, except February and March, the monthly birth-rates were higher than in 1892.

The number of deaths registered was 2,005,463, against 2,247,275 in 1892. The death-rate per 1,000 was 28·21, a lower rate by 3·71 than that of 1892, but higher by 2·99 than the average of the five years, 1888–92. As 1893 is stated to have been an unusually healthy year in Bengal, the fact that the death-rate is shown by the figures to be higher than the average of the previous five years, must be ascribed to the improved registration.

The average death-rate in the towns was 30·03 per 1,000. The rates were highest, 63·02, in Netrokona, in the Mymensingh district, and in Bhadressur and Kotrung, 62·66 and 60·41, respectively, in the district of Hooghly. In three other towns, Puri, Malda, and Buxar, rates over 50 per 1,000 were recorded. In 15 towns, death-rates under 20 per 1,000 were registered, the lowest rates being recorded in Darjeeling 14·20, and in Maniktala 13·84. Of the rural areas the highest mortality occurred in the Rajshahi, Darjeeling, and Malda districts, where the death-rates were 43·05, 42·10,

and 40·23, respectively, and the lowest in Manbhum 17·88, the Sonthal Parganas 17·16, and Singhbhum 16·66. The average death-rate in the rural areas was 28·12. With the exception of fever and small-pox, the death-rates from all causes were higher in the towns than in the rural areas.

The mortality among males was 29·91 per 1,000, against 26·53, the death-rate of females, showing a decrease of 4·14 and 3·23, respectively, compared with the figures of 1892. Contrasting the mortality among the different religious sects, it is found that the Muhammadans had the highest death-rate, 30·72 per 1,000, the Hindus came next, 27·78, then the Buddhists, 20·73, then Christians, 16·15, while "other classes" had the lowest death-rate, 12·59. In all cases the rates were lower than in 1892, and, except that in that year the death-rate among Hindus was higher than among Muhammadans, the different classes are arranged in the same order in both years. The ratio per 1,000 of mortality among infants under one year of age was 187·38, against 171·36 in 1892, and among children between one year and five years of age the death-rate was 36·56 in 1893, against 43·57 in the previous year. In the province generally the months in which the mortality was highest were, in order, December, November, October, and January.

The number of European seamen who arrived in the Port of Calcutta was 16,218 against 21,635 in 1892, and the average daily population was 2,081 against 2,133. The total number of deaths was 36 in 1893, against 25 in the previous year, the death-rates having been 17·29 and 11·72.

The number of births registered in Assam in 1893 was 151,391, and the birth-rate per 1,000 of the population was 30·15 against 31·05 in 1892, and 28·45 the average of the ten years 1882–91. Among the districts the highest rates were obtained in Goalpara 36·68 per 1,000, and in Sylhet 32·99, while the lowest were returned from the Khasi and Jaintia Hills 24·41, and from Nowgong 21·73. The low rate in Nowgong is mainly due to defective registration. In the *sadar* towns, where registration is compulsory, it is stated that there was a steady improvement in the registration of births during the year, and the average rate per 1,000 increased from 17·83 in 1892 to 22·25 in 1893. The highest birth-rate was recorded in Dibrugarh, 37·16, an increase of 3·04 over the rate of 1892. Tezpur followed at some distance with 29·42, a large increase compared with the rate of 20·19 per 1,000 recorded in 1892. The lowest birth-rate was 10·18 registered in Nowgong, where the rate in 1892 was 11·63. In the province, as a whole, the percentage of males born to females was 109.

There were 152,081 deaths registered during the year, and the death-rate was 30·28 per 1,000, against 34·21 in 1892, and 28·45 the registered mean for the decennium 1882–91. The highest death-rate in the districts was recorded in Nowgong, where it was 41·93, exceeding the birth-rate of that district by 20·20 per 1,000. The next highest rates were registered in Goalpara 34·93, and Darrang 32·33, while the lowest obtained were in the Khasi and Jaintia Hills, where only 19·50 deaths per 1,000 were recorded, and in Sibsagar, where the rate was 23·21. In Lakhimpur the death-rate exceeded the birth-rate by ·78 per 1,000, in Cachar by 1·49, in Kamrup by 2·63, and in Darrang by 6·93. In the remaining districts the birth-rates were the higher. In the *sadar* towns the average death-rate, including the deaths in the dispensaries, was 37·12, or if these deaths are excluded, 25·05 per 1,000, and, leaving the dispensaries out of count, ranged from 41·51 in Gauhati, to 13·26 in Dhubri, and 9·08 in Shillong. For every hundred female deaths, the deaths of 116 males were recorded; the excess of male mortality was 43 per cent. in Nowgong, and in the other districts ranged from 24 per cent. in Kamrup, to 10 per cent. in Sylhet. Among infants* the ratios of mortality per 1,000 living were, for males 159·58, and for females 141·36, and for boys and girls between one and five years of age the ratios were 34·09 and 33·53, respectively. At all the age periods, except those between 15 and 30, the death-rates of males were higher than those of females. The months in which mortality was highest were November, December, and October, while the lowest death-rates were registered in March and April.

In 1893, a year of exceptional healthiness and prosperity, there were registered in the North-Western Provinces and Oudh, the births of 1,003,852 males and 916,979 females, a total of 1,920,831, against 1,696,427 in 1892. The birth-rate for the year was 40·95 per 1,000 against 36·17 in the previous year, and 35·49, the average of the previous five years. In nine districts the birth-rate exceeded 45 per 1,000 of the

* In these calculations the Khasi and Jaintia Hills are omitted.

population, and in 29 the rates were above the provincial average. The highest rate was 51·29 per 1,000, recorded in the Moradabad district, while the lowest rates were 29·87, 28·39, and 26·60, recorded in the districts of Naini Tal, Ghazipur, and Dehra Dun, respectively. The average birth-rate in rural circles was 40·94, as against 41·02 the average in towns. Among the larger towns the high rate of 54·05 was registered in Moradabad, and in other large municipal towns the rates varied between 52·22 in Aligarh and 30·38 in Bareilly. Among the minor municipalities, in 22 the birth-rates exceeded 50 per 1,000, and in Amroha the recorded rate was 58·56 per 1,000. The percentage of male to female births in the province as a whole was 109·47. There was an excess of 790,614 births over deaths, and the growth in the population was quite exceptional, about three times the decennial average.

The total number of deaths registered was 1,130,217, and the death-rate was only 24·10, the lowest on record. In 1892 the death-rate was 34·11 per 1,000, and in the previous five years the average was 31·57. The general death-rate in the districts, exclusive of the towns, fell from 34·06 in 1892 to 23·68 in 1893, and ranged from 37·52 in the Moradabad district to 18·58 in Ghazipur. The death-rate in the municipal towns was 29·78 per 1,000, being 5·04 per 1,000 less than in the previous year. In the larger municipalities the death-rates ranged from 36·93 in Benares, and 34·06 in Lucknow, to 23·73 in Agra, and 21·34 in Allahabad; while in the minor municipalities, excluding the hill sanitaria, the death-rates ranged from 17·28 per 1,000 in Sikandra Rao, and 18·43 in Budaon, to the exceptionally high figure of 62·99 in Kashipur, a town of 14,717 inhabitants, situated in the Terai. Mortality among the inhabitants of cantonments declined as in every other section of the community, and the rate fell from 20·06 in 1892 to 16·49. Among infants under one year of age the death-rates per 1,000 living were 221·19 for males, and 199·03 for females, and among children between the ages of 1 and 12 the death-rates were 39·05 and 36·43, for males and females respectively. Among the various sects the lowest death-rate was 9·21, recorded amongst the Christian community, the death-rate of the Hindus was 23·99, amongst the Muhammadans it was 24·67, while amongst "other classes" it was 35·74. The highest monthly death-rates were recorded in May, November, and December, the lowest in February and July.

In order to bring about an improvement in the registration of vital statistics in the Punjab, the Local Government issued to Deputy Commissioners, in April 1892, the following instructions:—

1. "Tahsildars and Naib-Tahsildars, when on tour, shall examine village birth and death registers, "and when the numbers entered are suspiciously small, shall make inquiries with the view to finding "out whether the registers are accurately kept or not. When it is proved to their satisfaction that "the registers are defective, they shall warn or punish the chaukidar in fault as may seem necessary. "Kanungos should also occasionally test these registers when on tour."

2. "Tahsildars and Naib-Tahsildars shall submit each quarter to the Deputy Commissioner "a list of villages in which the registers were proved to be defective, stating the action taken "in each case, and the Deputy Commissioner shall forward the lists to the Sanitary Commissioner "for information."

3. "District officers, when on tour, shall cause village birth and death registers to be submitted "to them for inspection, and shall explain to ziladars, lumbardars, and all rural notables the "advantages which are derived from a correct system of vital statistics, and the interest "which Government takes in securing their correctness, and shall do their best to enlist "the services of these persons towards obtaining a more complete record than is furnished at "present."

It appears that in 1893 119 chaukidars and 11 lumbardars of villages were fined for neglecting to register births and deaths in the districts of Hissar, Kangra, Jullundur, Ludhiana, Montgomery, and Lahore. In the several municipal towns 145 persons were fined for failing to register births or deaths.

In 1893 there were registered in the Punjab 719,157 births, giving a ratio per 1,000 of the population of 34·99, against 38·16 in 1892. Excluding 1880, when the registration of births was introduced generally into the province, this is the lowest rate recorded, except in 1891 when it was 34·02. The Sanitary Commissioner advances two reasons to account for the low birth-rates in these years. (1.) That the years 1891 and 1893 were each preceded by a year of exceptional unhealthiness, 1890 and 1892 respectively furnishing the highest death-rates recorded in the province since registration was introduced; and (2.) The rates of 1891 and 1892 were calculated on the increased population obtained by the census of 1891. The diminution in the birth-rate was most marked in the districts of Gujranwala, Gurdaspur, Sialkot, Hazara, Gujrat, and Jhang, where it varied from 7 to 14 per 1,000.

The highest birth-rates were recorded in Gurgaon 47·70, Karnal 45·49, Delhi 44·77, Rohtak 42·49, Ludhiana 41·64, and Hissar 41·48; the lowest rates were registered in Simla, 18·9, and in the frontier districts of Peshawar 19·9, Hazara 22·1, Kohat 25·2, and Dera Ghazi Khan 26·0. The average birth-rate of the 45 municipal towns was 37 per 1,000 against 39 in 1892; the highest rates were registered in Kaithal 57, Panipat and Sonepat 53, and Palwal 51; and the lowest were recorded in Rawalpindi and Kohat 24, Ferozepore 25, and Dera Ghazi Khan 28. The percentage of males born to females was, in the province as a whole, 112·60; in Peshawar and Dera Ghazi Khan the ratios were 154·72 and 135·77 respectively. The provincial birth-rate exceeded the death-rate by 6·86 per 1,000. The excess was fairly general throughout the province, but was most marked in the districts of Rohtak, Gurgaon, Karnal, Hissar, and Delhi. In four districts only did the death-rate exceed the birth-rate, namely, Simla, Kohat, Peshawar, and Amritsar, the excess of deaths being 3·83, 2·39, 1·17, and 1·10 per 1,000, respectively.

In the 31 cantonments there were 1,995 births registered during the year, the ratio per 1,000 of the population being 8.

There were 578,176 deaths registered in the province during the year, a decrease in the number of last year of no less than 438,847. The provincial death-rate in 1893 was 28·13 per 1,000, against 49·48 in the previous year. Among the districts the highest death-rates were returned from Amritsar 37·01 and Lahore 35·18 per 1,000, while the lowest rates were obtained in Dera Ghazi Khan 22·5, Rohtak 22·1, Peshawar 21·1, and Hazara 19·6. The average mortality registered in the principal towns was 34·64 per 1,000 against 54·22 in 1892. The highest death-rate was 58·40 recorded in Kasur, the next highest 50·89 in Tanda and Urmar, followed by Kaithal, Hoshiarpur, and Amritsar, with death-rates of 48·45, 47·13, and 46·14 per 1,000 respectively. The lowest rates, varying between 26 and 30 per 1,000, were registered in the towns of Dera Ghazi Khan, Shahabad, Sirsa, Sadhaura, Rewari, Kohat, Chiniot, Jullundur, Gujranwala, Gujrat, Umballa, and Hansi.

The average death-rate registered in the cantonments was 11 per 1,000.

The year 1893 was comparatively healthy and the mortality in September and October was very low, compared with the average of the preceding ten years. The largest number of deaths was recorded in December, and the next largest in November. Next to these was January, the high death-rate in that month being ascribed to a continuation of the severe fever which was prevalent in the previous autumn.

The Muhammadan death-rate was 29·37 per 1,000, exceeding that of the Hindu population by 2·48. In many districts the death-rates of these two sects were nearly alike, but in Lahore, Simla, and Gujranwala, where the Muhammadan death-rates were respectively 41·93, 36·91, and 34·22 per 1,000, the death-rates of the Hindus were only 24·82, 19·86, and 21·64. In five districts only, Gujrat, Jhelum, Hazara, Bannu, and Dera Ghazi Khan, were the Hindu death-rates the higher, and in these the excess was very slight. The recorded death-rate among 18,375 Native christians was only 14·69 per 1,000, half the provincial death-rate.

The death-rates of infants under one year of age per 1,000 living were among males 176·73, and among females 169·35, the corresponding ratios for 1892 were 257·63 and 249·72 respectively. The death-rates for the age period one to five years were for males 42·76, and for females 43·52, against 95·90 and 104·24 respectively in 1892. As usual the number of deaths among female infants under one year of age largely exceeded the number of deaths of male infants in the districts of Jullundur, Ludhiana, Ferozepore, and Amritsar. The female death-rates exceeded those of males in the age periods between 5 and 40 years, but in the succeeding age periods the death-rates of males were higher than those of females.

There were 363,209 births registered in the Central Provinces in 1893, and the birth-rate, the lowest recorded since 1886, was 38·23 per 1,000 against 38·39 in 1892. The highest birth-rate was obtained in the Nimar district, 47·64, and the lowest in Wardha. In seven of the 20 districts the birth-rate was over 40 per 1,000. The average birth-rate in the *sadar* towns was 32·72. In the province, as a whole, 106·65 males were born for every 100 females, the percentage of excess being highest in the Nagpur district, where it was 11·08. There was an excess of births over deaths in every district, the provincial rate per 1,000 having been 10·53; the highest rates in excess were returned from Sambalpur 17·31 per 1000, Nimar 15·45, and Mandla 15·01. In the towns of Armori, Ashti, Bilaspur, Dhamtari, Garhakota, Mohgaon, Rajim, and Sambalpur, the death-rates were higher than the birth-rates; this was, in the opinion of the Sanitary Commissioner, due to faulty registration.

The total number of deaths registered was 263,143, or 61,205 less than in 1892. The decrease was mainly due to the comparative absence of cholera, and the diminished prevalence of "fevers." The ratio of deaths per 1,000 was the lowest since 1884, when it was 27·30. In the year under report it was 27·70, against 34·14 in 1892. The highest birth-rate was 33·73, recorded in the Narsinghpur district, and the lowest was 22·98 in Sambalpur. The average death-rate in the *sadar* towns was 25·52. Of infants under one year of age 348·96 males and 293·70 females per 1,000 living died during the year, and among children over one year and under five years of age, 35·25 and 29·42 per 1,000 of males and females, respectively, died. At all the age periods the death-rates of males were higher than those of females. Among Hindus the ratio of deaths registered per 1,000 of population was 24·95, among Muhammadans 27·82, and among "other classes" 42·93. The lowest death-rates were recorded in the months of February, March, and January, and the highest in October, December, and November.

In Berar the number of births registered in 1893 was 111,294, or 1,716 less than in the previous year. The birth-rate was 39·3 per 1,000 of the population against 39·9 in 1892, and 39·3 the mean of the previous five years. The decrease in the birth-rate is attributed by the Sanitary Commissioner to the unhealthiness of the province in 1891, and the high price of the staple food-grain (*jowari*) in 1892. In the districts the birth-rates varied considerably. In Ellichpur, Akola, and Buldana the rates recorded were over 43 per 1,000, in Amraoti the rate was 39·3, and in Basim and Wun, respectively, 35·9 and 29·6. In Wun, it is stated, that there is nothing to account for the low birth-rate but defective registration. In the towns, in all of which, except Amraoti Camp and Ellichpur Civil Station, registration is compulsory, the average birth-rate was 39·8 per 1,000, and ranged from a maximum of 53 at Akot, to a minimum of 30·2 at Khamgaon. In the province as a whole the proportion of male to female births was 106·6 of the former to every 100 of the latter. The number of births exceeded the number of deaths in every district.

There were registered 92,951 deaths, 10,827 more than in 1892, the increase in mortality having been chiefly due to fevers and bowel complaints. The death-rate was 32·0 per 1,000, as compared with 28·8 in 1892, and 32·8 the mean of the previous five years. In the districts the rates ranged from 39·9 in Ellichpur to 27·4 in Wun. The average urban death-rate was 32·4, and varied from 47·2 at Sirasgaon to 24·8 at Mehkar. In every district more males died than females, and the provincial excess rate for males was 2 per 1,000, against 1·6 the mean excess of the previous five years. Of infants under one year of age there died 259·8 males and 229·6 females per 1,000 living; the death-rates for boys and girls between one year and five were respectively 73·7 and 64·9. The highest death-rates were recorded in October, September, and November in the order given, and the lowest in February and March.

In Madras the registration of births and deaths is compulsory in municipal towns; special registrars are engaged, and the registers are inspected annually, either by the Sanitary Commissioner or his deputy, criticisms founded upon the inspection being forwarded to the Government, and to the municipality concerned. In rural areas, where compulsory registration is not in force, the village accountant or *karnam*, a Government servant, is responsible for registration. This man is generally an intelligent Brahmin, who is quite competent to keep registers correctly. The village accountants' registers are subjected to ample inspection, and although there is some difficulty in obtaining accurate statistics regarding the lower castes and females in rural areas, properly so-called, the system seems to be efficient; in rural towns, however, of over 10,000 inhabitants registration is very defective, as the population is too large for the efficient carrying out of registration by *karnams*. Moreover, in towns of this size, large numbers of families not connected with agriculture live, and over these the village headman and *karnam* have no influence.

In 1893, in Madras there were registered 909,153 births, the birth-rate for the Presidency being 27·0 per 1,000, against 25·1 in 1892. The highest rate registered in any district was 35·6 per 1,000 in Chingleput. In only three other districts, namely, Bellary, South Arcot, and Tanjore, were birth-rates over 30 per 1,000 obtained. In one district, Ganjam, the rate was only 18·1 per 1,000. In the remaining districts the rates varied between 20 and 30. In the municipal towns the average birth-rate was 34·1 per 1,000. From Cuddapah the remarkably low rate of 16·1 per 1,000 was returned; this is attributed to the long-continued exposure to malaria having diminished the fecundity of the inhabitants. In the other municipalities the rates ranged from 46·5 registered in Vaniyambadi to 23·9 in Chicacole. The birth-rate among Hindus was 27·3 per 1,000,

among Muhammedans 24·3, and among Christians 22·5. The percentage of male to female births was 104·3 in the districts, and 105·6 in the towns.

The number of deaths registered in 1893 was 649,782, against 750,755 in 1892, and the ratio per 1,000 was 19·3, against 22·3 in the previous year. Of the districts, by far the highest death-rate was recorded in Madras, 41·4, the next being Tanjore, 27·1 per 1,000; the lowest rates were furnished from Ganjam, 12·3, Vizagapatam 14·4, Nellore 15·3, and Godavari 16·8; but in these districts there are large zemindary tracts, and registration is most imperfectly carried out. The average death-ratio per 1,000 in the municipal towns was 31·1; the highest rates were recorded in Cuddapah, 46·9, and Madras, 41·1, and the lowest in Nellore, 18·0, Berhampur 19·0, Cuddalore and Anantapur 19·2, and Cocanada 19·5.

The deaths of 142,368 infants under one year of age were registered during the year, being a mortality of 156·6 per 1,000 of children born in 1893. The deaths of male infants were in the proportion of 115·6 to every 100 deaths of female infants. The death-rate per 1,000 of Hindus was 19·4, of Muhammadans 18·0, and of Christians 15·5. In the Presidency, as a whole, the most unhealthy months were November and December and the healthiest was June.

In 1893 there were 3,672 births registered in Coorg, giving a ratio of 21·22 per 1,000 of the population, against 21·12 in 1892. The proportion of males to every 100 females born was 101·64. As in former years, the number of deaths exceeded the number of births. There were 4,322 deaths registered, and the death-rate was 24·97 per 1000, as against 30·62 in 1892, and 24·08, the average ratio of the previous five years. The percentage number of deaths of males to deaths of females was 131. The death-rate among Muhammadans was 23·77, among Hindus 24·87, and among "other classes" 33·85 per 1,000 respectively. Among infants under one year of age 917 died, 466 being males, and 451 females, and among children between one year and five years of age 244 boys and 222 girls died. March was the healthiest month and July was the most unhealthy. In Merkara, the population of which, according to the census of 1891, is 7,034, the birth-rate per 1,000 was 10·94, the percentage of male to female births 156·67, and the death-rate 29·14 per 1,000.

In the Presidency of Bombay, including Sind, in 1893, there were registered 664,305 births, 13,638 more than in the previous year. The birth-rate was 35·30 per 1,000 against 34·57 in 1892, and 35·61 the mean of the 10 years 1883–92. Of the five registration districts the highest birth-rate, 39·14 per 1,000, was recorded in the Southern, and the lowest, 23·61, in Sind. Among the collectorates the highest rates were registered in Khandesh and Nasik, 47·24 and 46·12 per 1,000 respectively, and the lowest in the city of Bombay 18·48, and in Hyderabad 20·37. In nine of the 24 collectorates and districts, namely, Nasik, the city of Bombay, Satara, Ratnagiri, Kanara, Kaira, Ahmedabad, Karachi, and Shikarpur, the numbers of births recorded were less in 1893 than in the previous year; in the remaining 15 the numbers were greater. The registered birth-rates among the urban and rural popnlations were 27·97 and 36·32 against 28·24 and 35·46 in 1892. Except in the collectorates of Ahmednagar, Ratnagiri, Bijapur, Kanara, Karachi, Hyderabad, Shikarpur, and Thar and Parkar, the birth-rates were higher among the rural than among the urban populations. In 17 of the towns birth-rates exceeding 40 per 1,000 were recorded; the highest rates were obtained in Athni, Ahmednagar, and Borsad, 58·76, 52·58, and 49·35 per 1,000 respectively, and the lowest rates, 8·71, 18·61, 18·48, and 18·15, were recorded in Thana, Kaira, Bombay, and Nasik. The provincial percentage of male to female births was 108·32, but this proportion was exceeded in ten collectorates, and greatly exceeded in the districts of Sind. The largest number of births was registered in the month of October and the smallest number in February.

There were 511,831 deaths registered in the Presidency against 611,742 in 1892. The death-rate per 1,000 of the population was 27·20 against 32·50 in 1892, and 27·84 the mean of the 10 years 1883–92. The highest ratio among the registration districts was returned from Gujarat, 33·39 per 1,000, and the lowest from Sind, 16·87. Among the collectorates the highest rates, 38·00 and 37·29 per 1,000, were obtained in Broach and Ahmednagar, while in three collectorates in Sind, namely, Hyderabad, Thar, and Parkar, and Upper Sind Frontier, the low rates, 14·62, 15·94, and 15·59, were recorded. The registered death-rates were lower in 1893 than in the previous year in all the collectorates except three, Khandesh, Ahmednagar, and Sholapur, in which cholera was prevalent. In three collectorates, namely, City of Bombay, Kaira, and Ahmedabad, the registered birth-rates were much below the registered death-rates; in two, Kanara and Broach, the birth-rates were only slightly higher than the death-rates, but in all

the others the birth-rates were considerably the higher. The recorded death-rates among the urban and rural populations were respectively 30·05 and 26·80 per 1,000 against 36·13 and 32·00 in 1892. The death-rates among the rural populations were higher than among populations of the towns in Khandesh, Nasik, Thana, Kolaba, Poona, Satara, Dharwar, Kanara, Surat, and Broach, the difference being most marked in Broach, Kanara, and Kolaba, where the rural death-rates exceeded the urban by 15·86, 7·52, and 6·41 per 1,000 respectively. The highest death-rates recorded in towns were 54·77, 50·74, and 48·40, in Pandharpur, Viramgam, and Ahmednagar, respectively; the lowest rates were registered in Ratnagiri 18·71, Thana 16·32, and Panvel 11·71. The death-rate of males was 27·37 per 1,000 of males living, and 27 females died for every 1,000 living. In the City of Bombay the death-rate recorded among females was 11·41 per 1,000 higher than among males; in Nasik, Thana, Belgaum, Dharwar, Bijapur, Panch Mehals, Karachi, Hyderabad, Shikarpur, and Upper Sind Frontier the death-rates of males and females were about equal, in the remaining collectorates the death-rates of males were the higher. The death-rate of infants under one year of age was 162·78 per 1,000, and of children over one year of age and under five years 51·15.

During 1893, the greatest number of deaths was recorded in August, and the least in February; while this monthly distribution agrees with the results of the decennium 1883–92, it differs from the distribution in 1892, when the largest number of deaths was registered in January, and the smallest number in May.

In Lower Burma the work of registration was carried on by paid registrars in the towns, and by headmen in villages and rural circles. In rural tracts the collection of vital statistics was chiefly performed by the agency of village police-beat patrols. In most districts vaccinators are said to have rendered valuable assistance in the detection of omissions, which unfortunately were not confined to rural tracts, but were met with also in the towns, where fairly reliable registration might have been expected. In Rangoon, out of a total of 2,869 births registered, vaccinators were instrumental in bringing to light 1,804. On the whole, however, it seems that the registration of vital statistics has improved, as evidenced by the increased birth and death-rates, and by the greater uniformity in the district returns. There were 117,462 births registered during the year. The birth-rate was the highest on record, 26·03 per 1,000 against 24·83 in 1892. The highest rate, 27·6 per 1,000, was recorded in the Arakan division, and the lowest, 22·87, in Tenasserim. In the districts the rates ranged from 16·52 per 1,000 in Shwegyin, and 19·48 in Toungoo, to 31·55 in Tavoy, and 37·53 in Sandoway. The average birth-rate in the towns, having a population over 5,000, was 22·51 against 21·80 in 1892, and varied from 15·91 in Rangoon to 43·37 in Thatôn. As the Sanitary Commissioner remarks, it is but reasonable to expect a lower birth-rate in towns, where, out of a total population of 544,034, the males exceed the females in number by 123,248. In no district where the female births in excess, and in the province as a whole 108 males were born for every 100 females. The excess of births over deaths per 1,000 of the population was 4·28. Of the districts, in Akyab, Hanthawaddy, Prome, and Thayetmyo only were more deaths than births recorded; but in several of the towns, notably in Akyab, Rangoon, Moulmein, Toungoo, Prome, and Kyaukpyu, this occurred.

The number of deaths registered was 98·147, and the ratio per 1,000 was 21·75 against 20·00 in 1892 The highest death-rate, 26·22 per 1,000, was recorded in Pegu, and the lowest, 16·22, in Tenasserim. In the districts the ratios varied between 13·33 and 15·92 in Shwegyin and Amherst respectively, and 31·42 and 31·63 in Thayetmyo and Prome. The average death-rate in the towns was 28·26, and ranged from 11·74 in Mergui and 15·82 in Zalun to 39·93 in Allanmyo and 48·26 in Pantanaw. The percentage of the recorded deaths of males to those of females was 123 against 128 in 1892.

The death-rates among infants under one year of age were 208·55 and 139·53 per 1,000 living, for males and females respectively; among boys and girls between one and five years of age the rates were 33·15 and 28·22 respectively. The numbers of male deaths exceeded the numbers of deaths of females in every age period, but the death-rates per 1,000 living between the ages of 20 and 40 and over the age of 60, were higher for females. According to classes, the Hindus, as is usually the case, had the highest death-rate, 22·57 per 1,000, and the Christians the lowest, 11·44. The lowest mortality occurred during the hottest part of the year, while the highest corresponded with the months of heaviest rainfall and the dry cold weather.

History of Chief Diseases.

Cholera.

In 1893 the number of cholera deaths recorded throughout India was 218,113, against 762,695 in the preceding year. The diminution was general almost all over the country, including Lower Burma. Only in Assam and in the Native State of Hyderabad were the numbers of deaths of the year from cholera somewhat in excess of the numbers of the previous year, In the following statement the mortality in each province for 1893 is compared with the totals of the preceding sixteen years :—

Statement showing the Deaths from Cholera in the different Provinces in India from 1877 *to* 1893.

Year.	Bengal.*	Assam.	North-Western Provinces and Oudh.	Punjab.	Central Provinces.	Berar.	Rajputana.	Central India.	Bombay.	Hyderabad.	Madras.	Mysore.	Coorg.	Lower Burma.
1877	155,305	11,377	31,770	29	3,418	842	60	926	57,228	7,414	357,430	2,902	‡	7,276
1878	95,192	6,732	22,221	215	40,985	34,306	2,393	8,047	46,743	6,696	47,167	723	49	6,759
1879	136,363	17,415	35,892	26,135	27,575	223	918	2,734	6,937	6	13,296	14	—	1,828
1880	39,643	2,803	71,546	274	330	1	—	299	684	—	613	25	—	2,638
1881	79,180	5,010	25,865	5,207	9,140	3,404	197	581	16,694	1,721	9,446	25	3	5,239
1882	182,352	21,055	89,372	39	11,932	3,573	1,327	1,562	7,904	150	23,604	893	31	7,177
1883	90,439	14,908	18,160	190	16,235	27,897	797	1,740	37,954	1,947	36,284	124	—	2,185
1884	134,421	22,276	30,143	614	149	87	1,297	1,018	13,804	2,479	75,476	330	—	5,515
1885	173,767	7,753	63,457	1,936	21,868	3,683	1,615	4,624	37,287	1,387	58,109	2,677	—	7,685
1886	118,368	20,188	34,565	12	16,679	976	173	290	167	499	12,417	10	—	4,027
1887	172,578	7,941	200,628	8,804	12,576	14,396	2,612	8,868	25,711	2,831	28,359	832	3	2,649
1888	111,391	9,693	18,704	14,938	921	305	32	191	36,500†	2,057	58,677	1,015	2	15,982
1889	171,103	18,288	48,494	2,838	52,588	10,925	6,923	3,344	32,431	1,128	76,020	1,590	9	3,240
1890	145,885	15,396	80,295	3,401	4,737	347	2,746	3,132	3,259	—	35,288	1,326	5	1,076
1891	229,575	23,882	169,013	10,107	21,312	7,958	2,946	13,474	17,350	3,102	98,773	1,204	7	2,400
1892	259,398	21,552	194,886	75,959	39,972	2,030	26,760	8,384	42,900	53	79,033	5,497	58	6,208
1893	126,976	21,849	12,154	639	557	1,188	314	127	18,853	165	32,209	680	9	2,393

* Excluding Calcutta from 1877 to 1892.

† Including four deaths, the monthly distribution of which is not known.

‡ Statistics not available.

The following table shows the distribution of cholera by months in the different provinces. It will be seen from this that the largest numbers of deaths were recorded in October, November, and December, and the smallest numbers in February and March.

Statement showing the Deaths from Cholera registered in the different Provinces by months, during the year 1893.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratio of Deaths per 1,000 of Population. 1893.	1892.
Bengal	4,925	2,202	2,122	4,878	4,348	1,531	1,598	3,044	4,323	21,215	39,284	36,606	126,976	1·78	3·68
Assam	1,206	557	326	607	773	478	217	428	770	3,067	7,335	6,085	21,849	4·35	4·29
North-Western Provinces and Oudh.	187	59	44	4,038	3,832	1,323	810	270	439	605	398	140	12,154	0·26	4·15
Punjab	—	—	1	17	350	256	12	3	—	—	—	—	639	0·03	3·70
Central Provinces	—	2	23	8	1	6	—	150	153	131	47	36	557	0·06	4·21
Berar	—	—	—	—	—	—	10	356	378	313	56	75	1,188	0·4	0·7
Lower Burma	65	47	26	30	87	266	717	551	90	140	169	205	2,393	0·53	1·38
Madras Presidency	1,788	1,746	934	310	83	9	19	45	256	678	4,693	21,648	32,209	1·0	2·3
Bombay Presidency	84	48	256	3,270	3,607	1,742	1,216	5,104	1,661	841	365	59	18,853	1·00	2·28
Mysore	—	82	10	14	3	2	2	5	82	18	186	276	680	0·14	1·13
Coorg	—	—	—	—	—	—	—	—	—	—	1	8	9	0·05	0·33
Total	8,255	4,743	3,742	13,172	13,084	5,613	5,201	10,865	8,152	27,008	52,534	65,138	217,507	—	—

The relative prevalence of cholera in the urban and rural circles of the different provinces, and information regarding its period of greatest intensity in each, and on several other points, are shown in the following statement :—

Province.	Mortality in 1893.	Mean Mortality of previous Five Years.	Urban Mortality.	Rural Mortality.	Per cent. of Villages attacked.	Maximum Mortality in any one Rural Circle.	Maximum Mortality in any one Town.	Month of Maximum Prevalence.
Bengal - -	1·78	2·61	2·18	1·76	10·0	7·27	17·93	November.
Assam - -	4·35	3·54	4·11	4·36	20·5	9·79	23·08	November.
North-Western Provinces and Oudh.	0·26	2·22	0·18	0·27	1·8	3·72	2·41	April.
Punjab - -	0·03	1·04	0·02	0·03	0 2	0·50	0·59	May.
Central Provinces -	0·06	2·61	0·07	0·06	0·4	0·42	1·85	September.
Berar - -	0·4	1·5	0·3	0·4	2·2	0·7	3·7	September.
Lower Burma - -	0·53	1·49	0·69	0·51	3·1	2·31	9·45	July.
Madras - -	1·0	2·1	2·2	0·9	8·1	4·7	15·4	December.
Bombay - -	1·00	1·52	0·98	1·01	6·3	5·99	14·08	August.

The mortality ratios of this table are per 1,000 of population.

It will be seen that, except in Assam, the mortality of 1893 in each province was less than the mean of the previous five years. In Bengal, the Central Provinces, Lower Burma, and Madras, the death-rates were greater in towns than in rural circles.

In Bengal, in 1893, there were registered as due to cholera, a total of 126,976 deaths, less than half the number of the previous year, which was 359,398. The death-rate, per 1,000 of the population, was 1·78, as compared with 3·68 in 1892, and 2·61, the mean death-rate of the years 1888–92. Of the nine divisions, the highest death-rates were recorded in Dacca (5·67) and Chittagong (3·32), while the lowest death-rates were noted in Patna (·30) and Chota Nagpur (·07). Among the districts the highest death-rates were 7·27, 6·33, and 5·62, recorded in Dacca, Faridpur, and Noakhali respectively, and rates above 4 per 1,000 were registered in Rajshahi, Pabna, Mymensingh, Tippera, and Malda. The lowest death-rate was ·002 recorded in Champaran, the next lowest was ·009 returned from Lohardaga, and rates lower than 0·1 per 1,000 were registered in Hazaribagh, Palamow, and Saran. The average rural death-rate was 1·76 per 1,000, and the average urban death-rate was 2·18. The highest death-rates among the towns were 17·93 per 1,000, recorded in Jamalpur, a town of upwards of 15,000 inhabitants in the Mymensingh district, 13·53 in Jhalukati, in Backergunge, and 13·17 in Nator, in Rajshahi. In 27 towns, including Nadia, Dinajpur, Darjeeling, Bihar, Jagadispur, Sasaram, Revelganj, Siwan, Bettiah, and Motihari, no death from cholera was reported. In the province as a whole, the period of the greatest intensity of the disease was the last quarter of the year, the highest mortality occurring in November. These were also the conditions in Bengal proper and in Behar; in Orissa the greatest numbers of deaths occurred in August, November, and December; while in Chota Nagpur, where the mortality was inconsiderable, the greatest numbers of deaths were recorded in October and November. The exceptional absence of the disease during the second quarter of the year is attributed by the Sanitary Commissioner to the frequent and unusually heavy falls of rain in the early part of the year, which replenished and purified the water in the tanks and wells.

Apart from the peculiar seasonal incidence of the disease, the most remarkable circumstances concerning the cholera history of the year were the excessive mortality in the Dacca and Chittagong divisions, which are generally comparatively free from the disease, and the immunity, compared with the experience of the last few years, enjoyed by the districts of the Orissa division.

In the Dacca division the high cholera mortality is attributed to the exceptional height of the inundations. Writing of the Dacca district, the Civil Surgeon remarks :—

"An examination of the height of the inundation and the relative prevalence of cholera during the past few years, seem to indicate that an unusually high flood is followed by an unusual outbreak, and *vice versâ*. Thus the inundations in 1893 were the highest ever known, and it was also the worst cholera year on record. The floods were unusually high also in 1886, 1889, and 1890, which were bad cholera years. On the other hand, in 1887, 1888, 1891, and 1892 there was comparatively little cholera, and in these years the inundations were either usual, or lower than usual. It appears

that while cholera is always present in the district, the main fact in the production of an epidemic in this district is seasonal."

In Tippera, in the Chittagong division, the Civil Surgeon thinks that the floods, and the distress caused by them, must be held accountable for the high mortality, which occurred almost entirely in the last quarter of the year. In Noakhali, up to the middle of October, there was but little cholera; but immediately after the cyclone of the 22nd October, cholera, in a severe form, broke out all over the district. The magistrate of the district writes:—

"When everything appeared to be promising, and the agriculturists were gathering hope from the expected bumper crop that was on the ground, came the terrible cyclone of the 22nd October. The crops were more or less damaged, houses blown down, drinking water spoilt by salt water inundation, and by the decomposition of decaying matter. Cholera of a virulent type made its appearance, and the people already debilitated by scarcity of food, succumbed in large numbers to cholera and fever."

In the Chittagong district there was no epidemic, and the mortality was only ·54 per 1,000.

As remarked above, Orissa was comparatively free from cholera, as the following figures show:—

	1893.	1892.	1888–92.	
Cuttack	1·53	10·98	4·91	(Death-rates) per 1,000 of the population.
Balasore	1·83	15·00	6·68	
Puri	1·85	11·30	7·58	

The highest mortality in these districts except in Balasore, where the mortality was slightly higher in December, was registered in August, the month following the Car festival at Puri. Upwards of 200,000 pilgrims, the majority of whom belonged to the poorer classes, flocked into Puri:—

"And many thousands of them, for whom there was no room in the lodging-houses in the town, had to camp out in the fields and under trees. It is self-evident that the exposure thus endured, supervening on the privations of a long and weary journey, must have rendered them peculiarly susceptible to cholera in a district in which the water-supply for years has been polluted by a variety of nuisances."

In view of the occurrence of the festival every endeavour was used in Puri to ensure as pure a supply of water as possible, and an efficient conservancy. A cholera hospital was erected, and police constables were detailed at every travellers' rest-house to report the occurrence of sickness immediately. The lodging-house keepers were also ordered to report cases of sickness without delay, and several were prosecuted for negligence in this regard, and for turning the sick out into the streets in order to avoid the trouble of making reports. The first case of cholera is said to have occurred on the 11th of July in the person of a religious mendicant, who had arrived from Hardwar the evening before. He died before he could be taken to the hospital. On the same day, an old woman, a pauper from the North-Western Provinces, was removed to the cholera hospital suffering from cholera. From the 11th of July till the 7th of August the disease prevailed in an epidemic form. The slight resistance made to the disease by the enfeebled pilgrims may be judged from the fact that of upwards of 100 patients treated in the hospital, only 13 recovered. The exact number of cases which occurred in Puri during the festival is not stated, but the epidemic cannot have been severe, for only 271 cholera deaths were registered in the town during the year. The Civil Surgeon, Dr. Banks, writes:—

"Considering the very large number of pilgrims we had among us on this occasion, coupled with the fact that the price of food-grains was high, we have escaped very well indeed, and the death-rate is comparatively small. While the disease prevailed in the town a *mehter* was employed digging up and removing the soil, wherever a case of cholera was found, to the trenching ground, where it was carefully buried. A liberal supply of lime was used. The defiled clothing and bedding of patients were destroyed by fire in my own presence. The bodies of the dead were decently disposed of at the cremation enclosure."

Except at Puri, cholera was happily absent from the fairs and festivals held in Bengal in 1893.

In the port of Calcutta the European population was slightly less than in 1892, and the number of European sailors admitted into hospital suffering from cholera was the same, namely, 12, but 11 died as against 7, so that the death-rate, which in

the former year was 3·28 per 1,000, the lowest on record, rose to 5·28. Among the native floating population of the port there were 28 deaths in 1893, against 73 deaths in 1892, giving death-rates of 1·12 and 2·92 per 1,000 respectively of the estimated population.

The total registered mortality from cholera in Assam, in 1893, was 21,849, exceeding the mortality of the previous year by 297 deaths, and the average of the quinquennium, 1887–91, by 6,808. The death-rate from this cause was 4·35 per 1,000, against 4·29 in 1892, and 3·54, the average of the five years 1888–92. The high death-rates, 9·77 and 6·89 per 1,000, were registered in the districts of Nowgong and Cachar respectively. In the other districts the rates ranged from 4·87 in Sylhet, to 1·14 in the Khasi and Jaintia Hills. The rural death-rate was 4·36 per 1,000, while the average of the towns was 4·11. The highest urban death-rate was 23·08 per 1,000, recorded in a small town named Hailakandi in the Cachar district, where 15 deaths occurred among the 650 inhabitants. A death-rate of 10·19 per 1,000 was registered in Sunamganj. There was no death from cholera in Jorhat, North Lakhimpur, Shillong, and Jowai. Among the remaining towns the rates ranged from 8·91 in Silchar to ·57 in Sibsagar. Cholera was prevalent in the province generally in January, especially in the districts of Sylhet and Cachar; the minimum of mortality was registered in July, in October the mortality rose in both the Surma and Brahmaputra valleys, the maximum, 7,355 deaths was reached in November, and there were 6,085 deaths in December.

In the North-Western Provinces and Oudh in 1893 the mortality from cholera was the lowest since 1874, there having been only 12,154 deaths recorded as due to this disease, against 194,886 in 1892, and 169,013 in 1891. The death-rate per 1,000 of the population was ·26, against 4·15 in 1892, and 2·22, the mean of the previous five years. The Sanitary Commissioner instances the enormous mortality in the widespread epidemics of recent years, and the appearance, towards the end of the year under report, of the disease in Fyzabad and some of the Eastern Districts, to indicate his opinion that the decrease in cholera mortality in 1893 is only temporary. The disease was most prevalent in the districts of Garhwal, Gonda, and Bahraich, where the death-rates were 3·74, 2·52, and 1·32 per 1,000 respectively. In the districts of Pilibhit, Shahjahanpur, Bulandshahr, Etah, Etawah, and Hamirpur there were altogether only 12 deaths, and in Jalaun and Jhansi no death from cholera was recorded, while in the remaining districts the death-rates varied from ·63 in Fyzabad, to ·01 in Agra, Rae Bareli, Cawnpur and Banda respectively. The average death-rate in the rural areas was ·27 per 1,000, as compared with ·18 in the towns. In the large towns, with a population of over 100,000, the death-rates from cholera ranged from ·72 in Benares, where 150 deaths were recorded, to ·01 in Agra, where only one death was registered. Of the other large towns the death-rate in no case exceeded 1 per 1,000 of the population, except in Fyzabad-Ajudhia, where the death-rate was 1·73. In Meerut, Gorakhpur, and Jhansi no death was reported. Among the minor towns the highest death-rate was 2·41, returned from Gonda, where 42 deaths occurred among a population of 17,423. Death-rates exceeding 1 per 1,000 were recorded at Nehtor in the Bijnor district, and at Ballia. In the five pilgrim centres—Benares, Fyzabad-Ajudhia, Muttra-Brindaban, Hardwar and Allahabad, 340 of the 580 cholera deaths which were recorded in the towns of the province were registered, the mortality, proportionately to population, being three times, and in Fyzabad-Ajudhia nearly ten times, that of the towns generally.

In the hill tracts the greatest mortality occurred in June and July, and in the plains in April and May; but the disease remained in the districts of Fyzabad, Bara Banki, Sultanpur, Benares, Ghazipur, Ballia, Rae Bareli and Lucknow at the end of the year; deaths were also reported from Jaunpur, Azamgarh, Gorakhpur, Fatehpur and Budaun in December.

In 1893 there were 639 deaths from cholera registered in the Punjab against 75,959 in the previous year, and the death-rate, which in 1892 was 3·70 per 1,000, and in the previous five years averaged 1·04. fell to ·03. The highest death-rates were recorded in the districts of Gujranwala (·43), Simla (·34) and Montgomery (·32). In thirteen districts, namely, Rohtak, Gurgaon, Kangra, Ludhiana, Mooltan, Sialkot, Gujrat, Jhelum, Peshawar, Kohat, Dera Ismail Khan, Dera Ghazi Khan and Muzaffargarh, no cholera death was reported, and in the remaining districts the death-rates varied between ·06 in Karnal and ·001 in Delhi, Lahore, Hoshiarpur, Ferozepore and Rawalpindi,—in each of which one man's death was reported. The urban death-rate was ·02 per 1,000, and cholera caused death in only nine of the

45 towns. In Chiniot, a town of 13,476 inhabitants, in the Jhang district, there were 8 deaths, in Amritsar 7, and in Bhiwani, Delhi, Jagadhri, Hoshiarpur, Lahore, Gujranwala and Wazirabad one each. There was no fatal case of cholera recorded in the province in January and February, and only one in March, 17 were registered in April, 350 in May, 256 in June, 12 in July, and 3 in August. In the remaining months no death was reported.

There were 557 deaths from cholera registered in the Central Provinces in 1893, against 39,972 in 1892, and the death-rate, which was lower than any, except those of 1880 and 1884, was ·06 per 1,000, against 4·21 in the previous year, and 2·61 the mean ratio of the previous five years. The disease appeared in 11 of the 20 districts, the death-rates ranging from ·38 per 1,000 in Wardha and ·33 in Chhindwara, to ·01 in Saugor, Narsinghpur, and Seoni respectively. In the towns, the average death-rate was ·07; only eight of the 72 towns was affected, and the death-rates in these varied between 1·85 per 1,000 in Sambalpur and ·02 in Nagpur. The highest mortality was registered in September (153), August (150), October (131), and November (47). No death was recorded in January or in July.

The cholera of 1892 came to an end in December of that year, and Berar remained perfectly free from cholera until the end of July, when it appeared in the Akola, Amraoti, and Buldana districts. The remaining districts were affected in August. There were 1,188 deaths, against 2,030 in 1892, and the death-rate in 1893 was ·4, compared with ·7 in the former year, and an average of 1·5 for the previous five years. The death-rates in the districts varied from ·6 in Akola, to ·2 per 1,000 in Wun, in each case much below the quinquennial mean. The average cholera death-rate in the towns was ·3 per 1,000, in eleven of the 36 towns deaths were registered, and in these the death-rates varied from 3·7 in Wadegaon and 2·6 in Deulgaon Rajah to ·1 per 1,000 in Amraoti. The largest numbers of deaths were recorded in September, August, and October.

In 1893 there were 32,209 deaths recorded as due to cholera in Madras, against 79,033 in the previous year. The death-rate from this cause was 1 per 1,000, as compared with 2·3 in 1892, and 2·1, the mean ratio of the previous five years. The disease was especially prevalent in the districts of Tanjore and Trichinopoly, where the death-rates were 4·8 and 4·7 per 1,000 respectively. In the other districts the death-rates varied from 1·6 per 1,000 in Kistna, to ·002 in Bellary. The average mortality in rural circles was ·9 per 1,000, while the average in towns was 2·2. The highest urban death-rates 15·4 per 1,000 recorded in Paramagudi, 13·6 recorded in Gudiyattam and in Trichinopoly, 11·6 in Erode, in the Coimbatore district, and 10·2 in Tanjore. In the other towns in which the disease caused death the rates varied from 9·9 in Srirangam, to ·02 in Bellary. In 30 towns, including Adoni, Cuddapah, Kurnool, Tellicherry, Cannanore, Nellore, Vizianagram, and Ootacamund, no cholera death was recorded. The cholera epidemic of the cold weather of 1892 persisted during the first quarter of 1893 in South Canara, Malabar, Vizagapatam, Godavari, and Kistna. In the southern districts during this period there was in no instance upwards of 12 cases in a month. In January, February, and March there were respectively 1,788, 1,746, and 934 deaths in the Presidency, chiefly due to high mortality in Kistna, Godavari, and Malabar; in April the number of deaths fell to 310, of which 138 and 134 were recorded in Godavari and Kistna respectively. In May there were only 83 deaths, 42 in Godavari and 41 in Kistna. In June the minimum of 9 deaths was reached; in July there were 19 deaths, in August 45, in September 256, and in October 678. In November there were 4,693 deaths, of which the districts of Tanjore and Trichinopoly respectively contributed 1,521 and 1,673. In December the number of deaths reached the comparatively high figure 21,648, of which 9,183 were registered in Tanjore, and 4,544 in Trichinopoly. The disease was also very prevalent in Coimbatore, Madura, North Arcot, Salem, South Arcot, and Tinnevelly.

There were nine deaths registered in Coorg between the 28th of November and the 8th of December, the death-rate for the year was ·05 per 1,000 against ·33 in 1892, when 58 deaths occurred, and ·09 the mean ratio for the previous years.

Cholera was recorded as the cause of the deaths of 18,853 persons in Bombay in 1893, or 24,047 less than in the preceding year. The death-rate was 1·0 per 1,000 against 2·28 in 1892, and 1·52 the mean ratio of the previous five years. Amongst the collectorates the highest death-rates were 5·78 recorded in Surat, 3·36 in Broach, and 2·34 in Sholapur, and the lowest were ·07 in Thar and Parkar, ·01 in Kanara, and

·002 in Karachi. In the districts of Shikarpur, Hyderabad, and Upper Sind Frontier no death was registered. The average death-rate of the districts, excluding the towns, was 1·01 per 1,000, while the urban death-rate was ·98. In 27 of the towns, including Dharwar, Hubli, Bijapur, Hyderabad, Shikarpur, and Sukkur, there was no cholera death reported, and in Karachi only one, the single death in the district of the same name. The lowest death-rates in the remaining affected towns were ·08 in Kalyan and ·09 in Belgaum Cantonment, and the highest were 5 per 1,000 in Surat, 8·41 in Kaira, 13·14 in Dohad, and 14·08 in Pandharpur in the Sholapur district.

Pandharpur is a town of about 20,000 inhabitants, but is supposed to be capable of affording accommodation for 30,000 more. The sanitary state of the town is not satisfactory, it is ill drained, and in the highest part of the town there is no supply of water. Pandharpur is the seat of the Ashadi fair. In 1893 this fair opened on the 23rd of July, and as the river was in flood and heavy rain was falling on the evening of that day, the pilgrims, who attended to the number of 130,000, together with some 10,000 ponies and bullocks, which they had brought with them, sought refuge in the town, crowding with temporary shelters the road sides and every available open space.

Prior to the opening of the fair cholera was present, though not to any great extent, in the neighbouring collectorates of Satara, Poona, and Ahmednagar, and it existed in five villages of Sholapur, remote from Pandharpur. Although on the 23rd the town was reported to be free from the disease, there is good ground for the suspicion that this was not the case. Many of the pilgrims came from places where cholera was prevalent, passing through villages where it was present.

On the night of the 23rd July cholera broke out, and on the morning of the 24th 11 cases and five deaths were reported. On the 25th there were 38 cases reported, and that evening the pilgrims began to disperse. On the 26th, seven cases were reported at Ashti, the first halting-place out of Pandharpur, and on the 27th, 11 cases were reported at Barsi Road Railway Station, 31 miles from Pandharpur, where the pilgrims had to wait for their special trains. Up to the 24th of July, when the first case was reported from Pandharpur, there were 128 cases of cholera reported in the Sholapur collectorate, from the 25th to the end of the month there were 809, and the neighbouring collectorates showed a corresponding increase in cholera prevalence after the date of the fair. In reports received from 13 villages in Sholapur it was stated in six that the first cases of cholera occurred in the persons of individuals who had been to Pandharpur.

The disease was present in six districts in the presidency in January when 84 deaths were registered, in February it was present in only three, and the minimum, 48 deaths, was recorded. There was an increase in March, and in April and May the deaths reached the figures 3,270 and 3,607. There was a decline to about half these numbers in June and July, and a rise to the maximum, 5,104 deaths, in August. The mortality then gradually declined to the end of the year.

There were 2,393 deaths registered as due to cholera in Lower Burma in 1893 against 6,208 in 1892. The death-rate per 1,000 of the population was ·53 against 1·38 in 1892, and 1·49 the mean ratio of the previous five years. The highest mortality was 2·05 per 1,000, returned from Prome in the Pegu division, the next highest rates having been 1·41 and ·92 recorded respectively in Thayetmyo and Henzada in the Irrawaddy division. The district of Mergui alone escaped the disease; in the remaining districts the rates ranged from ·77 in Tharrawaddy to ·01 in Toungoo. The rural death-rate was ·51 per 1,000, while in the towns the average rate was ·69. The highest urban death-rate was 9·45 registered in Pantanaw, this was followed by 4·69 in Maubin, in the remaining towns which were affected the rates ranged from 3·92 in Thayetmyo to ·08 in Shwedaung. No case was reported in Paungde, Zalun, Moulmein, Thatôn, or Mergui. Generally in Lower Burma cholera breaks out in the hot dry months and increases in severity until the rains are fully established, when the disease diminishes till the end of the year. In 1893, however, this did not occur, the disease was present throughout the year, reached a minimum in April, increased in May, and more rapidly in June, to a maximum in July, began to decrease in August to a secondary minimum in September, after which it rose to the end of the year.

The following is a summary of the reports regarding the occurrence of cholera among troops and prisoners.

Among European troops, outbreaks of the disease have been reported from 10 different stations, 20 individuals were attacked and 13 died. Two of the cases were very slight and were possibly not cholera. In no instance was the first seizure preceded by exposure to unusual fatigue. In one fatal case the man, who had been

wading bare-footed in the dirty water of ditches for the purpose of netting fish, was attacked soon after his return to his quarters. In two fatal cases there was a history of heavy drinking prior to the attack, and in one of these, a surfeit of raw cucumber is suggested as the possible cause of the seizure. In another fatal case the victim had eaten some sardines, which were supposed to be unsound, three days before his attack. In eight first cases the occurrence of premonitory diarrhœa was noted. Among native troops the occurrence of the disease has been especially reported from seven stations; there were 15 attacks and 10 deaths. Six of those attacked were camp followers, and five, including three children, died. In no first case had there been unusual exposure to fatigue. One attack was attributed to the man having eaten an excessive quantity of raw fish. In two first cases there was premonitory diarrhœa. Reports have been received regarding the occurrence of 31 outbreaks among prisoners in 26 jails. There were 101 seizures in all, of which 45 proved fatal. In two first cases unusual fatigue had been undergone shortly before the attack, and in one of these, a boy, there had been partial starvation immediately before admission to jail. In two first cases there was premonitory diarrhœa.

Among European troops diarrhœa was specially prevalent during only one outbreak of cholera, and among Native troops there was no special prevalence of diarrhœa at the time of the occurrence of cholera. During nine of the outbreaks among prisoners diarrhœa was especially prevalent.

In the stations where cholera appeared among European soldiers 208 buildings were occupied by them, of these 18, or 8·6 per cent., furnished cases. Among Native troops, excluding Surat, whence details have not been supplied, and Umballa, where a sowar who was attacked at Hardwar was treated, 1,733 buildings were occupied by the men of the affected corps, and of these 8, or ·46 per cent., furnished cases. In the affected jails 547 buildings were inhabited, and in 62, or 11·3 per cent., cases occurred.

The disease appeared under very many various meteorological conditions.

Among European troops, in one instance in which two cases, both fatal, occurred, the disease is said to have been "undoubtedly imported from one of the villages around." Beyond the fact that cholera was present in these villages, no proof of this assertion is adduced. The man first attacked had been drinking to excess, and there was no connection between the first and second cases. At Roorkee the 3rd Company of the Bengal Sappers and Miners arrived from Assam on the 1st of April, three men were admitted to hospital suffering from cholera on the 2nd, 3rd, and 4th, and two died. One of those attacked was in attendance on the others, but developed the disease within few hours of the time the first man was seized. It is believed, by the medical officer in charge, that these three men contracted cholera on their way from Assam. One man of the 10th Bengal Lancers was seized with the symptoms of cholera just before he got into the train at Hardwar, he went on to his regiment at Umballa where he recovered under treatment, and there was no other case in the regiment. In jails on three occasions, in two of which the cases were fatal, the disease appeared in the persons of prisoners who had come from places in which cholera was present; in none of these instances did the disease spread. In the Sylhet Jail the first attacked was a man working outside the jail, but another man was seized within four hours; this man was working inside the jail, and no connection whatever was established between the two cases. In the Silchar Jail two prisoners were attacked, one day and two days respectively after admission to jail, from *bustis* in which cholera was stated to be present; the disease did not spread on either occasion.

The following statement shows the number and percentage attacked of those actually in attendance on persons suffering from cholera:—

Communities.	Number of Cases of Cholera treated.	Medical Officers, Hospital Assistants, and other Attendants on Cholera Cases.		Percentage of Attendants attacked.
		Number.	Number of these attacked.	
European troops	20	124	—	—
Native troops	15	50	1	2
Jails	101	260	—	—
Total	136	434	1	0·23

At Dum Dum, where one fatal case occurred, the drainage of the station is stated to be inefficient, owing to the impossibility of getting a proper outfall. At Meean-Meer, where four cases, of which three were fatal, occurred, it is stated that the canal whence the supply of drinking water was obtained may have been polluted. At Aurungabad, the water from the River Kham, which is used for drinking purposes, is very bad. In two jails there was overcrowding at the time of the occurrence of cholera. At Patna the well water was suspected, and at Backergunge the drinking water was saline.

Among European troops, beyond evacuating quarters and moving into others, or into tents pitched in the neighbourhood, no movement was made. In no instance was anyone attacked after the change of quarters. Among Native troops the only movement made was that of the Company of Sappers from Roorkee into Panyala Sanitary Camp; no case occurred after the move. Prisoners were moved into camp from the jail at Myingyan, 15 cases occurred before the move, and two within 24 hours after, and no more.

Small-pox.

The total number of deaths recorded from small-pox in India during 1893 was 68,819 or 32,302 less than in the preceding year. This diminution was distributed over Bengal, the North-Western Provinces and Oudh, the Punjab, Madras, Mysore, and Coorg. Omitting Mysore and Coorg from the comparison, the highest death-rates during the year were recorded in Lower Burma and Assam. The lowest death-rates from this disease in both 1892 and 1893 were registered in Berar, but in the latter year the deaths were more than twice as many as in 1892. The monthly distribution of the deaths is shown in the following statement:—

Statement showing the Deaths from Small-pox registered in the different Provinces by months, during the year 1893.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.		Ratio of Deaths per 1,000 of Population.	
													1893.	1892.	1893.	1892.
Bengal	1,523	1,467	1,685	2,154	2,328	1,588	1,215	850	432	364	414	511	14,531	22,359	0·20	0·31
Assam	169	236	257	325	294	365	251	152	104	117	110	263	2,643	1,452	0·53	0·29
North-Western Provinces and Oudh.	441	389	495	1,006	1,348	993	561	337	142	62	61	157	5,992	7,709	0·13	0·16
Punjab	675	381	371	286	438	503	326	189	169	144	204	399	4,085	11,173	0·20	0·54
Central Provinces	44	84	104	245	319	286	236	83	82	27	39	53	1,602	995	0·17	0·10
Berar	2	10	18	19	29	25	11	10	4	3	10	33	174	68	0·06	0·02
Lower Burma	430	459	451	410	309	363	210	132	123	65	55	74	3,081	1,463	0·68	0·32
Madras Presidency	3,300	4,093	4,337	3,458	2,508	1,812	1,708	1,467	1,277	1,179	960	1,170	27,289	43,757	0·8	1·3
Bombay Presidency	228	363	527	716	587	350	199	156	89	94	119	139	3,567	2,770	0·19	0·15
Mysore	562	557	714	645	588	556	512	413	351	323	190	230	5,641	8,462	1·16	1·75
Coorg	25	22	23	41	15	19	27	11	9	5	6	11	214	913	1·24	5·27
Total	7,399	8,061	9,002	9,305	8,763	6,860	5,256	3,800	2,782	2,383	2,168	3,040	68,819	101,121	—	—

The number of deaths reported to have occurred from small-pox in Bengal, in 1893, was 14,531, or ·20 per 1,000, rather less than two-thirds of the mortality of the previous year, when the death-rate was ·31 per 1,000, but in excess of the average death-rate, ·18, of the five years 1888–92. As in 1892, the disease was most prevalent in Puri and Cuttack; in the former district there was a slight increase, 25 per 1,000, in the mortality, while in the latter there was a decrease of 1·09. In these districts there is great difficulty experienced in carrying on the work of vaccination The objection of the people is not, it appears, to the operation, but to the payment of the vaccinators' fee of two annas for each successful operation. This difficulty is not, however, confined to Orissa, but is felt, though in less degree, all over the province. With regard to this the Sanitary Commissioner writes:—

"It was hoped, when the Vaccination Department was re-organised two years ago, that the moral influence which it was thought the magistrate and civil surgeon of the district would be able to exercise would meet the difficulty, but it has not been successful in doing so. The people in rural areas have come to learn that neither the magistrate nor the civil surgeon has the power to compel them to submit to vaccination, and they take advantage of the knowledge. On the other hand, the magistrate and the civil surgeon, knowing that they have no legal authority, naturally refrain from putting themselves in a false position by ordering the people in rural areas to be vaccinated. The result is an increasing difficulty in getting licensed vaccinators."

The urban mortality was ·19 per 1,000, against ·39 in 1892, and ·37, the average of the five years, 1888–92. In five towns the death-rates were over 1 per 1,000, namely—Raghunathpur, 9·00; Chaibassa, 4·08; Bhagalpur, 3·55; Puri, 2·74, and Bhabhua 1·46. In these towns, while the local officers attribute the incidence of the disease mainly to importation, the Sanitary Commissioner sets it down to shortcomings in local vaccination. In the province generally, the mortality among children under 12 years of age was 70·68 per cent. of the whole, infants under one year furnishing 20·97 per cent., children between one and six, 31·74 per cent., and children over six and under 12, 17·96 per cent. The largest numbers of deaths were reported in the months of April and May, and the smallest numbers in October and November.

In the Port of Calcutta no death occurred from small-pox among the European seamen, but one death was reported among the floating native population. No death occurred in these communities in 1892.

In Assam the number of deaths from small-pox increased from 1,452, or ·29 per 1,000 of the population in 1892, to 2,643, or ·53 per 1,000 in 1893. In the district of Kamrup, where the highest death-rate, 1·62 per 1,000, was registered in 1892, in the year under report, a rate of only ·48 per 1,000 was recorded. This, although the second highest death-rate in the province, was far behind that recorded in Goalpara, where 2,083 deaths were reported, giving a mortality of 4·60 per 1,000. The deaths occurred chiefly in Bijni, Sidli, and the Eastern Duars, where the people persistently refuse vaccination. In the *sadr* towns, where 47 deaths occurred in 1892, not a single death was reported. Of the deaths, 1,640, or 62 per cent., occurred among children under 12 years of age, and of this number 305 were under one year of age. The highest monthly mortality was recorded in June, and the lowest in September.

In 1893 there were 5,992 deaths from small-pox in the North-Western Provinces and Oudh, as compared with 7,709 in 1892, 26,355 in 1891, and 55,394 in 1890. The general decline in the mortality from small-pox in these provinces is very marked; during the last two years the death-rates have reached the lowest on record ·16 per 1,000 in 1892, and ·13 in 1893, and the last period of epidemic prevalence of the disease, in 1889–90, was distinguished by a great diminution of the death-ratios as compared with those of epidemics of former years. The highest district death-rate was 1·28 recorded in Kheri, the only district in which the death-rate was higher than the average of the previous five years. The districts of the Meehrut division were remarkably free from the disease, and in Dehra Dun no death from small-pox was recorded. The district of Cawnpore was almost free from the disease. The urban death rate from small-pox was ·21, and in only one of the large towns was the death-rate above ·31 per 1,000, namely, Bareilly, where the death-rate was 3·03. In 42 towns no death was recorded, and in 18 others only one death in each. In Laharpur, a small town in the Sitapur district, 59 deaths occurred, equal to a death-rate of 5·15 per 1,000, and in Kashipur there was the same number of deaths, the death-rate being 4·01. Among infants under one year of age, 1,726 deaths occurred, and amongst children over one year of age, and under 12, 3,987. The highest monthly death-rates were recorded in April and May, and the lowest in October and November.

In the Punjab, in 1893, there were 4,085 deaths from small-pox, against 11,173 in the previous year, and the death-rate was ·20 per 1,000, was the lowest on record, except in 1891, when the rate, ·17 per 1,000. During recent years there has been a gradual decrease in the small-pox mortality; during the ten years, ending with 1876, the average death-rate was 1·37, during the next ten years it was ·96, and for the seven years ending with 1893, the average has fallen to ·51 per 1,000. In 1893 the highest rates, varying from ·61 to ·43 per 1,000, were recorded in the districts of Karnál, Pesháwar, Shahpur, Kohát, and Umballa, while the districts of Rohtak, Delhi, Simla, Jhang, Gujránwála, Dera Gházi Khan, and Muzaffargarh were almost free from the disease. The towns which suffered most were Kaithal, Bhera, Peshawar, and Lahore, where the death-rates were 3·55, 2·47, 1·71, and ·65 per 1,000 respectively. Of the total deaths, 88·2 per cent. occurred among children under 12 years of age, including upwards of 25 per cent. among infants under one year of age. The largest number of deaths was recorded in the month of January, and the smallest number in October.

In 1893 the number of deaths registered, as due to small-pox in the Central Provinces was 1,602, or 607 more than in the previous year. The death-rate, ·17 per 1,000, with the exception of the rates recorded in 1891 and 1892, when they were ·08 and ·10 respectively, was the lowest of any recorded in the last 20 years. The district in which the highest death-rate was registered was Damoh, where ·61 per 1,000 of the population died from the disease. The next highest rates were ·45, ·36, ·32, and ·28,

returned from Bilaspur, Saugor, Sambalpur and Raipur, respectively. In Murwara only one death was reported, and in Nimar, Burhanpur, and Chhindwara, none at all. The Sanitary Commissioner observes:—"These results speak well for the vaccination work "of the province; it is probable that all eruptive fevers are entered as small-pox, "The supervision of vaccination by Civil Surgeons in the Central Provinces is "extremely efficient and extensive, and the immunity from this fearful disease that the "people enjoy is due to it." Of the total number of deaths upwards of 72 per cent. were in the persons of children under 12, more than 32 per cent. being infants under one year of age. The monthly mortality was greatest in May and June, least in October and November.

The number of deaths from small-pox recorded in Berar during 1893 was 174, as compared with 68 in the previous year, and 596, the mean of the previous five years. The death-rate per 1,000 of the population was ·06, against ·2, the quinquennial mean. There were 134 deaths registered in the Buldana district, where the small-pox death-rate was ·2 per 1,000, 19 in Amraoti, ten in Akola, and five, four, and two in Basim, Wun, and Ellichpur respectively. Only eight deaths in all occurred among the town population in the province. Of the total number of deaths, 60·3 per cent. occurred amongst children between one and 12, and 35·6 per cent. among infants under one year of age. The small-pox mortality was as usual relatively high in May and June, and lowest in the cold weather following the rains, but in 1893 the largest number of deaths was recorded in December. This unusual circumstance was taken to indicate the commencement of an epidemic, and vaccination was pressed on vigorously, in and around the affected districts. In the Berars the mortality from small-pox has gradually declined, the numbers of deaths in epidemic periods have diminished, and the intervals of quiescence between epidemic visitations have become longer. Regarding these facts the Sanitary Commissioner remarks:—

"The diminution in small-pox mortality in Berar can scarcely be attributed to normal causes, even by the most rabid anti-vaccinationist, who, for explanation, would probably fall back on those unknown laws which govern epidemic prevalence, in the absence of notification of disease, segregation of the sick, or the indigenous peripatetic inoculator; for inoculation has never been the habit or custom amongst the people of the province. In Berar, amongst the native population as well as amongst officials, this reduction in small-pox mortality, and great saving of life is, and with some warranty, attributed to successful vaccination."

The number of deaths in the Madras Presidency recorded as owing to small-pox was 27,289, and the death-rate per 1,000 was ·8, against 1·3 in 1892, and 1·0, the mean ratio of the previous five years. Excluding the district of Malabar, where the small-pox mortality reached 4·6 per 1,000, the average district rate was ·49 per 1,000. Regarding the exceptional mortality in Malabar, the Sanitary Commissioner writes:—

"It is probable that a very large percentage of the deaths from this cause occurs among the Moplahs, whose peculiar dislike to any innovation, under which vaccination would be classed by them, is notorious. Not only does this opposition to vaccination render them more liable to attack, but also their habit of overcrowding in dwellings must tell seriously against them. It is the custom for the married man to dwell with the family of his wife; thus room after room is crowded with additional families.

After Malabar, the highest death-rates were registered in Bellary and Godavari, 1·1 and 1·0, respectively; excepting the town of Madras, where the mortality was only ·04 per 1,000, the lowest death rates ·2 were recorded respectively in the districts of Cuddapah, Kistna, Nellore, Nilgris, and South Canara. The urban death-rate from the disease was ·5 per 1,000, ranging from 4·1 in Tirupati, in North Arcot, and 2·3 in Madura and in Palghat, in Malabar, to ·03 in Bellary and Vizagapatam, and ·02 in Cocanada. Of the total deaths, upwards of 11 per cent. occurred amongst infants under one year, and more than 26 per cent. amongst children between one year and 12 years of age. The largest numbers of deaths were recorded in the months of February and March, and the lowest numbers in November and December.

The number of deaths from small-pox registered in Coorg fell from 913 in 1892 to 214 in 1893. The death-rate in the latter year was 1·24 per 1,000, compared with 5·27 in the former, and 1·34, the mean ratio of the five years ending with 1892. Owing to the fact that only 38 of the 214 deaths registered occurred in hospitals and dispensaries, leaving 176 returned under this heading by village *patels*, it is suspected that eruptive fevers other than small-pox were included by them. Of the total number of deaths, 68, or 31·7 per cent., occurred amongst children under 12, including 8·8 per cent. amongst infants under one year of age. The largest numbers of deaths, 41 and 27 respectively, occurred in April and July and the lowest numbers, 5 and 6, in October and November.

In the Presidency of Bombay, during 1893, there were 3,567 deaths recorded as due to small-pox, against 2,770 in 1892, and 5,298 the decennial mean. The death-rate per 1,000 of the population was ·19, against ·15 in 1892, and ·31, the mean of the ten years, 1883–92. Among the collectorates, the highest rates, ·78 and ·55 per 1,000, were registered in Thana and Kolaba respectively, and the lowest, ·01, in Kaira, Ahmedabad, and Shikarpur. No death was registered in any one of the following districts:—Broach, Hyderabad, Thar, and Parkar, and Upper Sind Frontier. The average small-pox death-rate of the towns was ·30 per 1,000, the rates ranging from 1·98 in Kalyan, to ·01 in Surat. In 32 of the towns no death was registered. Of the total number of deaths nearly 79 per cent. occurred amongst children under 12, including 24·6 per cent. of the total amongst infants under one year of age. The largest numbers of deaths were registered in the months of March (527), April (716), and May (587), while the smallest numbers were recorded in September (89), October (94), and November (119).

In Lower Burma, in 1893, there were 3,081 deaths ascribed to small-pox, against 1,463 in the previous year. The provincial death-rate from this disease was ·68 per 1,000, against ·32 in 1892, and ·51, the mean of the previous five years. The incidence of the disease was most severe in Arakan, the three districts of that division having the highest death-rates in the province, viz.: Akyab, 3·68 per 1,000, Sandoway, 1·19 per 1,000, and Kyaukpyu, ·99 per 1,000. The next highest rates were recorded in Hanthawaddy and Thongwa, ·90 and ·84 per 1,000 respectively. No death was reported from this cause in Toungoo or Tavoy, and in the districts of Thayetmyo and Prome, only five deaths and three respectively were registered. The average death-rate in the towns was ·63 per 1,000. In Pantanaw, in the Thongwa district, 100 deaths were registered, giving the large death rate of 16·58 per 1,000. The next highest rates were 4·06, recorded in Akyab, and 2·44 in Maubin, also in the Thongwa district. The lowest rates were ·05 in Moulmein, ·09 in Pegu, ·13 in Bassein, and ·19 in Rangoon. In 16 towns no death was recorded. Of the total number of deaths, 17·8 per cent. occurred amongst infants under one year, and 42·4 per cent. among children between the ages of one and 12 years. The largest numbers of deaths were registered in the months of the first quarter, and the smallest in the months of the last quarter of the year.

Fevers.

In 1893, fevers were less prevalent than in 1892, and the total number of deaths returned under this head throughout the country amounted to 3,761,724 against 4,621,583 in the preceding year. All the provinces, with the exception of Berar, Lower Burma and Mysore, participated in this decrease. The highest death-rate was recorded in Bengal, and the lowest in Madras. In the following statement the deaths from fevers in the different provinces are shown, month by month, in each Province during 1893, and the totals of the year are compared with those of the previous year:—

Statement showing the Deaths from Fevers registered in the different Provinces, by months, during the year 1893.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.		Ratio of Deaths per 1,000 of Population.	
													1893.	1892.	1893.	1892.
Bengal - -	125,454	91,334	89,420	98,438	117,406	86,501	100,340	116,143	103,091	171,337	184,563	193,261	1,477,288	1,607,716	20·78	22·84
Assam - - -	6,059	5,315	5,195	5,191	6,452	7,326	6,947	6,860	6,985	6,737	7,081	7,315	77,463	93,971*	15·42	18·72
North Western Provinces and Oudh.	69,760	61,224	64,016	70,042	77,365	62,988	58,609	70,910	73,649	80,659	90,236	106,143	883,601	1,168,077	18·84	24·90
Punjab - -	43,464	31,255	25,623	21,244	28,624	25,939	21,811	29,170	31,436	39,128	45,373	45,989	389,506	715,890	18·95	34·83
Central Provinces -	11,052	9,779	10,692	12,265	12,927	10,756	13,112	15,574	16,706	19,035	19,094	18,836	169,918	188,017	17·88	19·79
Berar - -	2,168	2,019	2,080	2,681	2,702	2,098	2,668	4,471	5,145	6,899	6,559	6,058	45,548	41,661	16·0	14·6
Lower Burma -	5,304	3,839	3,531	3,614	2,509	4,324	4,819	4,593	3,764	4,067	4,224	5,060	50,648	44,422	11·22	9·84
Madras Presidency	22,168	19,748	22,203	22,533	19,958	18,050	19,166	21,358	21,345	21,291	22,783	27,812	258,415	280,627	7·7	8·3
Bombay Presidency	29,471	26,601	26,573	28,761	27,327	25,260	28,545	33,767	30,547	33,914	35,324	35,070	361,160	438,038	19·19	23·27
Mysore - - -	3,407	4,339	5,194	5,181	3,393	3,115	3,351	3,506	3,344	3,203	3,145	3,620	44,798	39,705	9·25	8·19
Coorg - -	309	260	219	268	229	295	380	328	307	278	239	267	3,379	3,459	19·52	19·98
Total -	318,616	255,713	254,746	270,218	299,892	246,652	259,748	306,680	294,859	386,548	418,621	449,431	3,761,724	4,621,583	—	—

* Includes 6,734 deaths from "Kala Azar."

The number of deaths registered as due to fever in Bengal in 1893 was 1,477,288, or 20·78 per 1,000, against 1,607,716 or 22·84 per 1,000 in the previous year, and 1,264,352 or 17·79 per 1,000, the mean of the last five years. Making every allowance for improved registration, there can be no doubt that the fever mortality in Bengal is steadily increasing. Concerning this phenomenon the Sanitary Commissioner remarks :—

"After an experience of 22 years spent in the study of the health of the people of Bengal, I have no hesitation in saying that the crying want of the Province is improved drainage, and that until this is provided there will be no diminution in the death-rate from fever, which, in the present condition of things, must go on increasing. The Drainage Bill, which is now before the Bengal Legislative Council, has been conceived in the truest and best interests of the people of the land, and I hope for their own good that nothing will prevent its passing into law."

In rural circles, the death-rate during the year under report was 20·98 per 1,000, against 23·01 in 1892, and 18·09, the average of the quinquennium 1888–92. In urban circles, the rates for the corresponding periods were, respectively, 16·88, 17·09, and 11·88 per 1,000. Of the districts, Rajshahi, Jessore, Malda, Murshidabad, Dinajpur, Nadia, and Jalpaiguri, in the order named, suffered most, while Balasore and Puri, in Orissa, suffered least. The local medical officers attribute the high mortality to the insufficient clothing and housing of the people in the cold season, when most of the deaths occur, to the miserable physical condition of the people, to the impure water-supply, and to the water-logged state of the country. In 34 of the 46 districts the fever mortality was less than in 1892, but in 12 there was an increase; and in five of these the increase was more than one per 1,000, namely, Pabna (1·11), Malda (2·56), Nadia (3·15), Shahabad (4·10), and Murshidabad (5·41).

As usual in the Province, the heaviest mortality from fever occurred in the months of October, November, and December. During these months no rain fell, but the lands rendered marshy by the heavy falls of the previous months were drying up, and at that time the great diurnal changes of temperature are sufficient to excite attacks of fever in weakly folk, saturated with malarial poison.

Among the European seamen in the Port of Calcutta, there were 180 cases of fever admitted into hospital; of these, four were diagnosed as enteric fever, 133 as malarial, and 43 as simple fever. One death occurred from each variety of fever, giving an increase of the death-rates per 1,000, as compared with 1892, under each heading respectively, of ·02, ·48, and ·48.

In Assam, the total number of deaths attributed to fever fell from 93,971 in 1892, to 77,463 in 1893, and the death-rate from 18·72 to 15·42 per 1,000. The average number of deaths recorded for the five years 1887–91 was 72,160, and the average death-rate was 14·37 per 1,000. There was a diminution in the mortality from fever as compared with 1892 in all the districts except in Nowgong, where there was an increase of 5·42 per 1,000. The highest death-rates recorded were in Nowgong (27·41), Goalpara (24·63), Kamrup (22·22), and Darrang (20·34), in the remaining districts the rates were lower than 13 per 1,000 of the population. The Sanitary Commissioner points out that there was a much lower rainfall than usual in the valley of the Brahmaputra, but in Nowgong the river overflowed its banks and flooded the country, while the low-lying lands of Goalpara, Kamrup and Darrang are invariably under water from the same cause for many months of the year.

Regarding the prevalence of *kala azar* in the province generally, few details are available; it appears that it raged severely in Nowgong, was prevalent in Darrang, and was diminishing in Goalpara and Kamrup. The observation that the presence of the *anchylostomum duodenale* is only an accidental circumstance, has received further confirmation. When on tour in Assam last year, I had an opportunity of seeing some cases which the local practitioners diagnosed to be *kala azar*. In each case there was a history of previous malarial fever and chronic dysentery combined, which induced me to believe that *kala azar*, in these cases, at least, was nothing more than the same effects of these diseases as seen in other malarial countries in India, intensified by the damp climate and uncleared forests of Assam.

The deaths from fevers recorded in the North-Western Provinces and Oudh in 1893 numbered 883,601, against 1,168,077 in 1892. The death-rate per 1,000 of the population was 18·84, against 24·90 in the previous year and 24·42, the mean of the previous five years. The highest district death-rates per 1,000 from fever were 32·35 and 31·25, recorded in Naini Tal and Moradabad respectively, while the lowest rates were 10·71 and 7·02, recorded in Gorakhpur and Partabgarh. The rural fever death-rate was 18·73, or 6·20 per 1,000 less than in 1892, while the urban

death-rate from this cause fell from 24·53 in 1892, to 20·27 per 1,000 in 1893. The ratios of mortality in cities with over 100,000 inhabitants ranged from 27·99 in Cawnpore and 24·09 in Lucknow, to 12·40 in Bareilly. Among the minor towns death-rates of 38·59, 34·53, 33·49, and 32·11 were registered in Kashipur, Manglaur, Najibabad, and Sikandrabad respectively. Mortality from fever was at its lowest in July; there was a progressive rise in fever mortality from August, when the number of deaths was 70,910, to December, when the registered mortality reached a total of 106,143. The percentage of deaths from fever to the total mortality was 78, but varied much in different districts. Regarding this variation the Sanitary Commissioner writes:—

"The fever mortality as tabulated year after year, is, as regards most districts, virtually a statement of mortality from all causes, and the actual deaths from the fevers of medical nomenclature do not ordinarily number more than one-third of the total recorded mortality under this head."

Mahamari in Kumaon.—Two limited but associated outbreaks of this extremely fatal and infectious disease occurred in *Pargana* Danpur, a few miles off the Bageswar-Berinag road, and about two marches from Bageswar. House sanitation generally, in this part of the Himalayas, is most defective, the air space allotted to each individual is insufficient, and there is an entire absence of ventilation of the sleeping apartments. The victims of the first outbreak were two fairly well-to-do families, living in the end rooms of a block of three houses, the central block being untenanted. The houses are situated on the upper margin of an extensively cultivated terraced area, the houses of neighbours are dotted about, but there is no aggregation of houses to form a village. The site and surroundings are naturally healthy, and the climate is particularly good, so that, except for the defects in house sanitation mentioned above, the circumstances of the individual are favourable to health. The first case occurred on the 8th of July, in the person of a girl whose father was said to have died of the disease ten years before. She died on the 10th of July, and by the 3rd of August every member of the two households, 11 persons in all, had succumbed to the disease. The scene of the second outbreak was less than a mile away. A man named Tejgir helped on the 17th of August to burn an infected shed, in which the dead of the disease had lain. On the 13th of September, Tejgir was attacked, and died on the 18th, having previously infected those about him, two males and a female, who died, and a friend named Panagir, who visited him on the 13th September. Panagir returned to his home, five miles off across the Pangra river, on the same day, was attacked on the 14th of September, and died the next day. Regarding the nature of the disease the Sanitary Commissioner writes:—

"Mahamari is an infectious fever of extreme virulence, cephalalgia or intense headache with delirium being a frequent symptom, followed in a large proportion of cases by glandular swellings in the neck, axilla, groin, &c., and often terminating fatally within three or four days." * * * * *
"The accidental uncovering of a grave, disturbance of the soil, &c., or the unearthing of a long neglected or hidden household article, may undoubtedly let free the specific poison, just as the special communicable poison of scarlatina, small-pox, &c., may be wrapped up in a dirty rag, or other article, for years."

It is not improbable that the *mahamari* of the mountainous district of Kumaon is the same disease as the bubonic plague with which Hong Kong and Canton were recently so severely visited, due to the same causes, overcrowding in houses from which fresh air is virtually excluded, together with personal uncleanliness and extremely dirty surroundings, the "accidental uncovering" of which may have let loose the probable causes.

In 1893 there were 389,506 deaths registered as due to fever in the Punjab, against 715,890 in the previous year, and the death-rate under this heading was 18·95 per 1,000, against 34·83. There was a reduction in the fever death-rate in every district in the province, and in some the reduction was very marked. In nearly every district the rainfall was deficient during the third quarter of the year, and in all those districts in which a great diminution in the fever mortality was recorded, with one exception, the rainfall was less than in the previous year. The diminution in the rainfall was by no means proportional to the reduction in the mortality, and in the exception, Jhelum, while the rainfall during the third quarter was greater by about one-fifth, the mortality fell from 37·67 in 1892, to 16·80 in 1893. The districts in which the death-rates were below the provincial average were Simla, Delhi, Kangra, and Gujrat, where the rates varied from 10·27 to 14·76. The highest death-rates, ranging from 24·44 to 22·57, were recorded in Lahore, Gurdaspur, Muzaffargarh, Gujranwala, Amritsar, and Kohat. The average death-rate from fevers in the 45 municipal towns was 17·55 per 1,000, against 31·02 in 1892, the rates ranging

from 34·99 in Tanda and Urmar, and 33·37 in Kasur, to 8·37 in Ferozepore, and 6·34 in Ludhiana.

The number of deaths from fever registered in the Central Provinces during 1893 was 169,918, or 18,099 fewer than in the previous year. The death-rate per 1,000 of the population was 17·88, against 19·79 in 1892, and 20·51 the mean of the previous five years. There was an increase of the fever death-rate in six districts, and a decrease in each of the remaining 14. The highest rates were 27·43 per 1,000 recorded in Nimar, and 24·46 recorded in Narsinghpur, while the lowest rates, 12·51 and 6·50, were registered in Betul and Sambalpur respectively. The average fever death-rate in the towns was 13·37 per 1,000, and the rates varied between 29·90 in Charwa, in the Hoshangabad district, and 5·22 in Sailao in the Wardha district.

The mortality from fever in Berar rose from a total of 41,661 deaths in 1892, to 45,548 in 1893. The death-rate per 1,000 of the population was 16·0, against 14·6 in 1892, and 15·2, the mean of the previous five years. In the districts the death-rates ranged from 20·3 in Wun, to 12·3 in Buldana. The urban death-rate was 15·9 per 1,000. As regards season, the greatest mortality occurred in the fourth quarter of the year, instead of in the third, as is asually the case; this is accounted for by the occurrence of an epidemic of influenza at that time, and an exceptionally heavy rainfall in November. The lowest mortality occurred in the months of February, March, and June. Regarding the distribution of fever in the province, the Sanitary Commissioner writes:—

"* * * the malarial or telluric poison, to which the greater part of this fever mortality is due, is more prevalent in certain tracts than in others, as, for instance, at the base of the hill ranges, where there is much vegetable deposit in the soil brought down from the hills, thus the tract of country extending along the northern boundary of the province, including the circles of Ellichpur, Anjangaon, Akot, Telhara, and Jalgaon; and again those tracts where there is much uncultivated land, or where it has recently been cleared for purposes of cultivation. In these tracts the opening of new land produces malaria, which lessens by degrees as cultivation improves. Of this condition the Wun district is an example. Though these general conditions of surface and subsoil account in a great measure for the prevalence of fevers on certain tracts more than on others, yet a considerable part of the mortality is doubtless due to an aggravation of the disease by purely local causes operating in and around dwellings, which a better sanitary condition would do much to mitigate."

In 1893, in the Madras Presidency, 258,415 persons died of fever, and the death-rate was 7·7 per 1,000, against 280,627 deaths and a death-rate of 8·3 in 1892. The mean death-rate of the districts, excluding municipal towns, was 7·6 per 1,000, and the rates ranged from 19·7 in Cuddapah, and 18·6 in Kurnool, to 3·2 in Tinnevelly, and 1·8 in Tanjore. The mean death-rate in the municipalities from this cause was 8·8 per 1,000. The highest rates were returned from Cuddapah, 32·2 per 1,000, followed by Kurnool with 17·5 per 1,000 and Madras with 15·0 per 1,000. The lowest death-rates were recorded in Cocanada 2·5, Calicut 3·0, and Cochin 3·1. The greatest mortality occurred in December, the least in June.

The total number of deaths from fever registered in Coorg was 3,379, a rate of 19·52 per 1,000, compared with 19·98 in 1892, and 18·15, the mean ratio of the previous five years. The largest number of deaths, 380, was registered in July, and the smallest number, 219, in March.

In the Bombay Presidency during 1893, 361,160 persons were reported to have died from fever, against 438,038 in the previous year, and 325,132, the mean of the previous 10 years. The death-rate from this cause, per 1,000 of the population, was 19·19, against 23·27 in 1892, and 19·21, the mean death-rate of the decennium 1883–92. Of the registration districts, the highest mortality occurred in Gujarat, where the death-rate was 26·56 per 1,000, in the other registration districts the death-rates were lower than the provincial mean, the lowest rate being 15·56 recorded in Sind. Excepting Khandesh and Ahmednagar, in every collectorate the fever death-rate of 1893 was lower than that of 1892, and in 14 collectorates it was lower than the decennial mean. The highest rate, 30·57, was recorded in Broach, and this was followed by 28·22 in Kaira, 27·84 in Ahmedabad, 25·82 in Ahmednagar, and 25·53 in Khandesh. As usual, the collectorates of Ratnagiri and Bombay were credited with the lowest mortality, 10·97 and 7·21 per 1,000 respectively. The maximum mortality from fever occurred in November, when 35,324 deaths were registered, and the minimum monthly mortality, 25,260, was recorded in June. It is stated that in 1893 the mean temperature was lower, the rainfall, although in excess in Broach and Godhra, was on the whole less, and the price of food-grains was lower than in 1892.

In 1893, in Lower Burma, there were 50,648 deaths registered as due to fever, against 44,422 in the previous year. The death-rate from this cause was 11·22 per 1,000, against 9·84 in 1892, and 8·94, the mean ratio of the previous five years. This is the highest fever mortality ever recorded in Burma, and concerning it the Sanitay Commissioner observes:—

"The increase in the total number of deaths from fevers, especially in rural tracts, seems to point to greater accuracy in registration."

Of the four divisions into which the older province is divided, the highest ratio of deaths was recorded in Arakan, 15·22 per 1,000, and the lowest in Irrawaddy, 8·78. The highest district death-rates were registered in the adjoining districts of Prome and Thayetmyo, where 21·38 and 18·13 deaths per 1,000 of the population were recorded respectively, and the lowest death-rates, 5·55 and 5·71, were returned from Thongwa and Pegu. The mean ratio for rural areas was 11·57, and for urban areas 8·68. The fever mortality was heaviest in January and December.

Dysentery and Diarrhœa.

The deaths from "Dysentery and Diarrhœa" in 1893 numbered only 201,127, against 234,370 in 1892 and 243·456 in 1891. This decrease was general all over the country, with the single exception of the small province of Berar. The highest mortality, 5·2 per 1,000, occurred in Berar, and the lowest, ·7 in Madras and North-Western Provinces and Oudh. The following statement shows the monthly details of deaths from these causes in each province:—

Statement showing the deaths from Dysentery and Diarrhœa registered in the different Provinces, by months, during the year 1893.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.		Ratios of Deaths per 1,000 of Population.	
													1893.	1892.	1893.	1892.
Bengal	3,592	2,558	2,479	2,681	3,030	2,455	3,242	3,771	3,449	4,583	4,382	4,928	41,150	48,491	0·57	0·68
Assam	966	812	713	851	1,193	1,414	1,327	1,226	1,217	1,508	1,950	1,676	14,853	15,685	2·96	3·12
North-Western Provinces and Oudh.	2,319	1,948	1,909	2,519	3,539	3,308	3,183	3,151	3,162	3,006	3,056	3,456	34,556	42,448	0·74	0·90
Punjab	1,564	875	687	783	1,586	1,604	1,302	1,397	1,722	1,809	1,655	1,166	16,150	21,781	0·79	1·06
Central Provinces	769	679	683	942	1,086	954	1,347	1,654	1,501	1,325	1,071	990	13,001	16,021	1·37	1·69
Berar	488	420	488	678	719	753	1,109	2,481	2,607	2,326	1,568	1,185	14,772	11,200	5·2	3·9
Lower Burma	300	243	271	269	325	540	981	850	477	304	318	344	5,222	5,449	1·16	1·21
Madras Presidency	1,854	1,568	1,610	1,386	1,435	1,685	2,330	2,685	2,388	1,876	2,097	2,900	23,814	32,293	0·7	1·0
Bombay Presidency	2,466	2,110	2,261	2,555	2,431	2,423	3,583	4,551	3,240	2,705	2,301	2,339	32,965	35,406	1·75	1·88
Mysore	365	336	367	355	366	410	411	428	388	365	335	334	4,460	5,307	0·92	1·10
Coorg	16	6	9	18	19	24	19	12	15	26	11	9	184	289	1·06	1·67
Total	14,699	11,555	11,477	13,037	15,729	15,570	18,834	22,156	20,166	19,833	18,744	19,327	201,127	234,370	—	—

In Bengal the number of deaths registered as due to dysentery and diarrhœa, in 1893, was 41,150, or ·57 per 1,000, against 50,855, or ·71 per 1,000, in the previous year, and an average of 50,388, or ·70 per 1,000 in the five years 1888–1892. Among the districts, Darjeeling, with a death-rate of 5·22 per 1,000, leads, as usual; it is folllowed by Calcutta (4·22), Howrah (3·88), Balasore (3·27), and Puri (2·79). The rural death-rate was ·45 per 1,000, compared with ·59 in 1892, and 60 the average of the previous quinquennium. The urban death-rate, 2·98 per 1,000, was identical with the rate of the previous year, but somewhat in excess of the average of the previous five years, which was 2·81. The highest death-rates were 11·72, 11·68, and 11·42, recorded respectively in Bhadreswar, Serampore, and Kotrung, towns in the Hooghly district. The mortality was highest in December, closely followed by the mortality in October and November, and the smallest number of deaths was recorded in June.

In the Port of Calcutta, there were 64 cases of dysentery admitted to Hospital from amongst the European seamen, of whom two died, against 114 admissions with two fatal cases in 1892.

Under dysentery and diarrhœa in Assam, in 1893, there were registered 14,853 deaths, equal to a death-rate of 2·96 per 1,000 of the population. Although this death-rate is ·16 per 1,000 less than that recorded in 1892, still the Sanitary Commissioner considers that it is higher than it ought to be, owing to many cases of cholera, which was

present in all the districts of the province, being returned as dysentery or diarrhœa. The highest death-rates were recorded in Lakhimpur 6·64 per 1,000, Sibsagar 4·36, and Cachar 4·26, and the lowest in Goalpara ·71, and Kamrup ·99. The rural death-rate was 2·88 per 1,000 and the urban 6·00. The largest numbers of deaths were recorded in November and December, and the smallest numbers in March and April.

In 1893 34,556 deaths were registered under dysentery and diarrhœa in the North-Western Provinces and Oudh, against 42,448 in the previous year, and the death-rate was ·74 per 1,000 as compared with ·90 in 1892, and 1·13, the mean of the previous five years. The diminution in the mortality from these diseases corresponded with the decline in the mortality generally. In Garhwal, Almora, and Dehra Dun districts the mortality was, as usual, highest, the death-rates being 7·60, 4·53, and 4·02 respectively, against 7·62, 6·02, and 3·85 in 1892. In the Naini Tal district the ratio, 2·44, was slightly less than that of the previous year. In the other districts the rates ranged from 1·80 per 1,000 in Moradabad to ·04 in Basti and Bahraich. In the towns the average death-rate from these causes was 2·16 per 1,000. In the larger towns the death-rates range from 7·61 in Koil-Aligarh and 7·56 in Moradabad, to ·09 in Cawnpore. Among the smaller towns a death-rate of 19·37 was recorded in Kashipur, and death-rates of 10·48 and 7·50 were registered in Nagina and Bulandshahr respectively; in Muzaffarnagar, Khurja, Shikarpur, Mindhawal, and Badgaon, and in seven other towns of over 10,000 inhabitants, only one death, in each, from these causes was registered. In Aonla no death from dysentery or diarrhœa was reported. The heaviest mortality from these diseases occurred in May, and the lightest in March.

From dysentery and diarrhœa there were registered 16,150 deaths in the Punjab in 1893, against 21,781 in 1892. The death-rate was ·79 per 1,000, against 1·06 in 1892, and ·85, the mean of the previous five years. The death-rate among males, ·85 per 1,000, was again markedly higher than the female death-rate, ·71. The districts in which the death-rates largely exceeded the principal average were Delhi (1·67), Gurgaon (1·53), Gurdaspur (1·53), Amritsar (1·44), Mooltan (1·30), Sialkot (1·20), and Umballa (1·02). The average death-rate in the rural areas was ·66 per 1,000, little more than a fourth of the urban death-rate, which was 2·42 per 1,000. The death-rates in many of the towns were high, the highest having been recorded in Hoshiarpur (6·84), Pind Dadan Khan (6·51), and Kasur (6·11). The largest numbers of deaths from these causes took place in September and October, and the smallest numbers in March and April.

During 1893, in the Central Provinces, 13,001 deaths were attributed to dysentery and diarrhœa, against 16,021 in 1892. The death-rate under this heading was 1·37 per 1,000, against 1·69 in 1892, and 2·17, the average death-rate of the five previous years. As in former years the death-rate of males (1·50) was higher than that of females (1·24), and this peculiarity was observable in every district in the province, except Damoh. The highest district death-rate was 3·24 recorded in Sambalpur, the lowest ·13, returned from Bhandara. The rural death-rate was 1·35 and the urban 1·53. In Panaghar, a small town in the Jubbulpore district, the highest death-rate from these causes was recorded, 7·11 per 1,000. The greatest numbers of deaths were registered in August and September, the smallest in February and March.

The total number of deaths registered under dysentery and diarrhœa in 1893 in Berar was 14,772, or 5·2 per 1,000 of the population, against 3·9 in the previous year, and 5·2, the mean rate of the previous five years. Amongst the districts, the highest rates, 10·3, 8·1, and 5·0, were recorded in Ellichpur, Akola, and Amraoti respectively, the other three districts situated in the upland country averaging 2·9, while the actual death-rates in them were 3·9 in Basim, 3·8 in Buldana, and 1·2 in Wun. The average rural death-rate was 5·4, against 3·7 in the towns. The diseases were most fatal in August and September, least so in February.

The number of deaths attributed to dysentery and diarrhœa which were recorded in the Madras Presidency in 1893, was 23,814, and the death-rate was ·7 per 1,000 of the population, against 1·0 in 1892, and ·9 the mean ratio of the previous five years. The average death-rate of the rural districts was ·5 per 1,000, ranging from 2·2 in Chingleput and 1·4 in Malabar, to ·2 in Kistna and Kurnool, and ·1 in Vizagapatam. The urban death-rate was 3·1 per 1,000; highest 9·6, in Vizagapatam, lowest ·06, in Kulasékarapatnam, while in 12 towns no death under this heading was recorded. The largest numbers of deaths were returned in December (2,900) and August (2,685), the smallest numbers in April (1,386) and May (1,435).

The number of deaths recorded under this heading in Coorg was 184, as compared with 289 in 1892. The death-rate was 1·06, against 1·67 in 1892, and 1·28, the mean ratio of the previous five years. As usual the largest numbers of deaths occurred during the monsoon months, April to October.

During 1893, in the Presidency of Bombay, there were 32,965 deaths ascribed to dysentery and diarrhœa, against 35,406 in the previous year, and a decennial mean of 39,836. The death-rate per 1,000 of the population from these causes was 1·75, against 1·88 in 1892, and 2·35, the mean ratio of the previous five years. The highest recorded death-rates were 4·28 per 1,000 in Belgaum, 4·03 per 1,000 in Nasik, and 3·75 per 1,000 in Khandesh, while the lowest were ·02 per 1,000 in Panch Mahals, ·03 in Shikarpur, and ·07 in Hyderabad. The rural death-rate under this heading was 1·74 per 1,000, whilst the average in the towns was 1·88. The highest recorded urban death-rates were 11·21 per 1,000, returned from Nandurbar, in Khandesh, and 9·95 returned from Kaladgi, in Bijapur, while the lowest were ·02, ·05, and ·08, registered in Broach, Shikarpur, and Dohad respectively. In Deolali cantonment, Malegaon, Godhra, Ahmedabad cantonment, and Larkhana, no death from these diseases was reported. In March, April, and August, the numbers of deaths recorded from dysentery and diarrhœa exceeded the numbers recorded in 1892; in all other months the numbers were less. The largest numbers of deaths occurred in the months of July and August, and the smallest numbers in February and March.

In Lower Burma, in 1893, there were 5,222 deaths registered as due to dysentery and diarrhœa, against 5,449 in the previous year. The death-rate from these diseases per 1,000 of the population was 1·16, as compared with 1·21 in 1892, and 1·12, the mean ratio of the five previous years. The death-rates of males were higher than those of females in every district in the province, the general average being 1·38 per 1,000 of the population for males, against ·90 for females. The highest death-rate was 4·13 per 1,000 recorded in Tavoy, the next highest being 2·28 in Akyab, and 2·16 in Thayetmyo; the lowest death-rates were ·42 per 1,000, recorded in Amherst and in Shwegyin, and ·43 in Thongwa. The rural death-rate was ·98 per 1,000, while in the towns the average was 2·45. By far the highest urban death-rate was 8·66 registered in Allanmyo, the next highest was 4·09 returned from Akyab, the lowest rates were ·25 and ·30 returned from Kyangin, in the Henzada district, and Mergui respectively. In Maubin and Zalun no death from these diseases was reported. The highest mortality occurred in the months of July and August, "when most of the deltaic "country is water-logged, and in the condition of a morass," and the lowest in February, March, and April.

Vaccination.

The total number of vaccinations throughout India during 1893–94 was 7,493,643, of which 7,325,853 were performed by the special establishments, and 167,790 by the Dispensary staff. Of the total 6,716,134 proved successful, including 147,132 of the dispensary cases, against a total of 6,396,482 in 1892-93. This increase was distributed over all the provinces excepting Bombay, Berar, Assam, and Coorg. The average number of persons vaccinated by each vaccinator was highest in the Punjab (3,519) and lowest in Bengal (579). In all 6,537,984 primary operations were performed by the special establishments, and the percentages of success among them varied from 86·35 in Upper Burma and 86·77 in Assam, to 99·33 in Bengal and 96·3 in Madras. The re-vaccinations, in all the provinces taken together numbered 787,869, and the proportion of success in them ranged between 21·2 per cent. in Berar and 81·0 in Madras. Of the 167,790 operations performed at dispensaries, 154,944 were primary cases with percentages of success ranging from 65·06 in Assam to 96·61 in Bengal, and 12,846 were cases of re-vaccination, among which the lowest proportion of success, 25·0 per cent., was obtained in the Punjab, and the highest, 72·5 per cent., in Madras, and 100 per cent. in Upper Burma, where, however, there were only 32 re-vaccinations. Of the total number of children vaccinated during the year, the operation in 2,589,731 instances proved successful among those under one year of age, and 3,036,785 among those between one and six years of age. The proportion of population protected by vaccination varied from 24·23 per 1,000 in Upper Burma to 56·96 in Coorg. This was precisely the order also in 1892–93. Omitting these the highest proportion, 37·72 per 1,000, was recorded in the Punjab and the lowest, 24·54, in Bengal. Assuming the birth-rate of any province to be 40 per 1,000 of the population, it is estimated that 30 per 1,000 will live long enough to be available for vaccination

during the vaccinating season. On this basis it may be said that vaccination among infants has not yet been thoroughly carried out in any province, the proportion of children under one year of age protected by vaccination being highest in Berar, viz., 24·4 per 1,000, followed by 22·1 in Bombay and 20·4 in the Central Provinces; in the other provinces this proportion varied between 19·8 in the Punjab and 5·2 in Bengal. The total amount spent during the year on vaccination was Rs. 11,26,386, and the average cost of each successful case ranged in the different provinces from one anna and six pies in the Punjab to six annas in Bombay.

The total number of vaccinators employed during the year in Bengal was 3,295, or 250 more than in the preceding year, and the strength of the supervising staff, which was increased by six, was, including Civil Surgeons, 265. The aggregate number of operations performed, including both primary and secondary cases, was 1,844,304, of which 1,817,022 were successful; the corresponding numbers for 1892–93 were 1,836,411 and 1,812,259, and for 1891–92, 1,641,088 and 1,614,501. Of the total, 1,829,416 were primary cases, of which 1,809,718 proved successful. The total number of infants protected during the year was 363,942, and of children between one and six years of age 1,255,638. The average number of persons operated on by each vaccinator of the special establishment fell from 632 in 1892–93, to 579 in 1893–94, the lowest in India. In the year under report the ratio of successful vaccinations (24·54 per 1,000 of population) exceeded the figures for the preceding year by only ·02; the death-rate from small-pox was ·20 per 1,000 against ·31 in 1892.

In Assam one more vaccinator was employed during the year, but the total number of operations was only 184,426 or 15,815 less than in the preceding year. The operations performed by the Provincial and the Dispensary establishments and on the tea gardens were all less than in the preceding year. Owing chiefly to the failure of the lymph supply in the early part of the vaccination season the percentages of success achieved during the year fell in primary cases of the special establishment from 94·53 in 1892–93 to 86·77 in 1893–94, and in the dispensary operations from 81·72 to 65·06. The average number of persons operated on by each vaccinator also decreased from 927·04 to 849·89; and the ratio of persons protected fell to 28·33 per 1,000, against 31·51 in 1892–93, and 29·93 in 1891–92. In the areas under the Compulsory Vaccination Act also the amount of work done was less than in 1892–93.

In the North-Western Provinces and Oudh the provincial staff was strengthened by the addition of 24 vaccinators; the total number of operations performed by them was 1,365,373 against 1,112,117 in the preceding year, the average number of persons vaccinated by each man having increased from 1,350 to 1,610. Of the above total 1,339,711 were primary cases with success in 1,181,600 instances, or at the rate of 93·13 per cent., and 25,662 were re-vaccinations with success at 58·87 per cent., the corresponding ratios for the preceding year being 92·43 and 56·50 respectively. In addition to these 3,407 operations were performed by the medical subordinates attached to dispensaries; of these 3,384 proved successful in primary cases and nine in re-vaccinations, the percentages of success being, respectively, 84·90 and 39·13, against 90·50 and 33·15 in 1892–93. In all 522,658 infants, or about 27 per cent. of the children born during the year, were protected by vaccination. These figures are somewhat higher than those for 1892–93, but the number remaining unprotected is still very high. The proportion of persons successfully vaccinated (25·38 per 1,000) was higher than in any of the preceding years since 1877; the rate of mortality from small-pox was only ·13 per 1,000 against ·16 in 1892, which was the lowest on record during the last 16 years. Animal lymph was largely used in the second circle; in the third circle operations were performed with it at Allahabad, Jhansi, and Lalitpur, and in the first circle in only Agra and Mainpuri.

Only one second-class vaccinator was added to the average strength of the establishment in the Punjab in 1893–94. The total number of operations performed was 1,048,522 or 232,439 more than in the preceding year. This was to a great extent due to the very large number of operations performed in the Kangra District, where there were no less than 275,844 re-vaccinations. In primary cases the increase which was distributed over 17 districts, amounted to 14,177 operations. In the remaining 14 districts the numbers were less than in the preceding year, and the deficiency was most marked in Hoshiarpur, which was also conspicuous in this respect in 1892–93. The total number of children under one year of age who were successfully vaccinated was 408,601, which falls short of the total for 1892–93 by 9,616. The ratios of success

in primary vaccinations and in re-vaccinations were 94·30 and 48·80 per cent., respectively, against 95·45 and 57·40 in the preceding year. The use of animal lymph has become almost universal in this province, the actual number of operations performed with it being 843,238, or 80 per cent. of the total.

During 1893–94 the vaccination establishment in the Central Provinces was increased by the addition of five men to the provincial staff and two to the staff of the feudatory states. The total number of operations performed was 440,656 against 435,410 in the preceding year. But the number of primary cases and the percentage of success in them fell from 394,194 and 96·68, to 380,488 and 95·48. The decrease was most marked in the Bilaspur district, where 6,584 fewer operations were performed than in the previous year. There was a large increase in the number of re-vaccinations, which rose from 41,216 in 1892–93 to 60,168 in 1893–94. Besides these 18,903 operations were performed by the dispensary officials, in these the percentage of success in primary cases was 91·27, and in re-vaccinations 69·68, against 92·09 and 70·67 in 1892–93. In all, 247,857 children under one year of age, or about 50·9 per cent. of the estimated number born during the year, were protected; the corresponding figures for the preceding year were 259,632, or about 53·5 per cent. In all districts vaccination was carried on direct from buffalo calves.

Although there was no change in the strength of the Berar establishment, the total number of vaccinations performed by the provincial staff fell from 145,882 in 1892–93 to 137,152 in 1893–94, and the average number of operations per vaccinator from 3,316 to 3,117. This decrease is attributed to the prevalence of sickness among the vaccination staff and among the people generally. The percentage of success in primary cases was 95·1 and in re-vaccinations 21·2, against 94·7 and 24·8 in 1892–93. In all 101,298 persons were successfully vaccinated during the year, or about 35·0 per 1,000 of the population, the corresponding ratio for the preceding year having been 37. The total number of children under one year of age who were protected by vaccination was 70,681, or about 76 per cent. of the recorded births of the year, and 61 per cent. of the births estimated at 40 per 1,000 of the population. With reference to the progress of vaccination in the province the Sanitary Commissioner remarks, that "Vaccination in Berar has come to that point, when fluctuations in the "number of primary operations will mainly depend upon healthy and prosperous "seasons or the reverse, as affecting the fecundity and well-being of the people."

In the year under report the strength of the Madras vaccination establishment was short by three, the total number of operations performed rose from 1,126,200 in 1892–93 to 1,150,319 in 1893–94, and the average number operated on by each vaccinator from 1,348 to 1,381. Besides these, 28,513 operations were performed by the Dispensary establishment. Altogether 1,099,553 persons were protected by vaccination during the year, or 30 per 1,000 of the population. The corresponding ratio in 1892 was 28·7. The death-rate from small-pox was only ·8 per 1,000, which is less than that of any of the four preceding years. The mortality was very high in the Malabar district. Here, in consequence of the opposition of the people, vaccination is rather backward, but still in the year under notice the number of primary operations was greater than in the preceding year. The total number of children under one year of age who were successfully vaccinated was only 241·927, or 16·9 per cent. of the estimated number of children born during the year; the numbers in the preceding year were 259,459 or about 18·1 per cent. of the estimated number of births. Most of the operations were carried on with animal lymph, either direct from calf or with preserved paste.

In Coorg the numbers of operations performed by the special establishment was 10,821, by the medical subordinates attached to dispensaries 721, or 11,542 in all, against 12,401 in 1892–93. The percentage of success in primary cases was 93·74 and in re-vaccinations 78·65 against 94·25 and 81·35 respectively in the preceding year. Altogether 10,386 persons were successfully vaccinated, or 56·96 per 1,000 of the total population. But of the estimated births of the year only about 15·9 per cent. were protected. All the operations in Coorg were performed with calf lymph.

In Bombay the total number of vaccinations fell from 977,128 in 1892–93, to 964,358 in 1893–94, and the number performed by each vaccinator from 1,794 to 1,756. Of these 900,028 were cases of primary vaccination, successful 94·21 per cent. and 64,330 were re-vaccinations, successful 59·12 per cent. In addition to these 3,796 operations were performed in dispensaries and of them 81·57 per cent. were successful in primary cases and 69·63 in re-vaccinations. In all 887·212 persons were successfully vaccinated

during the year, or 30·10 per 1,000 of population—a ratio which is less than that of any year since 1881. The percentage of annual estimated number of children born who were successfully vaccinated (55·2), though higher than that of most other provinces, was lower than the ratio for 1892–93, when it stood at 56·0 per cent. Animal vaccination was carried on in the towns of Bombay, Karachi, Thana, Kurla, Bandra, Kalyan, Igatpuri, Sholapur, Ahmednagar, Belgaum, Dharwar, Hubli, Gudug, Bettigeri, and in the city and cantonment of Poona, and in five Talukas of Ahmednagar, seven of Poona, and two of the Sholapur Collectorate.

In Lower Burma there was an increase of 13 vaccinators in the provincial establishment during the year, and the number of operations performed by them was 175,808 against 156,116 in 1892–93, but the average number accomplished by each vaccinator fell from 2,402 to 2,254. There was an increase in the number of operations in all the districts with the exception of Akyab, where the total fell short of the number for the previous year by more than sixteen thousand. The percentage of success in primary cases was higher than in 1892–93, having been 90·27 against 86·65. In addition to these, 1,548 operations were performed by the Dispensary officials with 87·71 per cent. of success in primary cases, and 29·85 per cent. in re-vaccinations. In all 142,689 persons or about 30·35 per 1,000 of population, and 25,000 infants, or about 13·4 per cent. of the estimated number of births were protected during the year by vaccination.

In Upper Burma the area in which vaccination was carried on in 1893–94 embraced a population of 3,474,361, and the number of vaccinators employed during the year was 46, as against a population of 3,455,886 and 33 vaccinators in 1892–93. The aggregate number of operations rose from 77,991 to 98,726, but the average number performed by each vaccinator fell from 2,363 to 2,146. Besides these, 2,694 vaccinations were carried out in dispensaries. The total number of successful cases in the province was 86,370, or about 24·23 per 1,000 of the population. The percentage of success in primary cases was 86·35, and in re-vaccinations 44·73, against 86·09 and 73·61 in 1892–93.

Sanitary Works—Military.

The total expenditure on Military Works during 1893–94 was Rs. 85,93,935 against Rs. 90,88,203 in 1892–93. The details of the works executed during the year are not yet available.

Civil Sanitary Works.

Excluding Calcutta there were 146 municipalities in Bengal in 1893, against 145 in the previous year, and the total income of these, including a balance from 1892, was Rs. 37,39,825. Omitting expenditure on the construction, maintenance, and repair of roads, Rs. 16,13,960 were spent on sanitary works, or Rs. 1,35,246 more than in 1892. In round numbers, of these 16 lakhs, 2 lakhs and 14,000 were devoted to water supplies, a lakh and 83,000 to drainage, while 2 lakhs and 63,000 were expended on the treatment of sick persons. The town in which the largest proportion (39·31 per cent.) of the municipal income was spent on original sanitary works was Maniktola, while in 48 municipalities nothing was spent under this head. The town in which the largest percentage (82·29) of the municipal income was spent on sanitary works of an annually recurring nature was Nasirabad, while the smallest percentage (2·21) was spent in Patuakhali. In the towns and rural areas many improvements were carried out during the year by municipalities, district boards, and by private individuals. These were chiefly the provision of filtered water supplies, the making of new tanks and wells and the cleaning of old ones, and the improvement of surface drains. In the villages the only clean places are the interiors of the houses, and the surroundings are exceeding filthy. The Sanitary Commissioner makes one exception, the village of Kesath in the district of Shahabad, "where," he says, "Babu Shankar Dayal Singha, "the resident Zemindar, manages through his tahsildars and other employés to keep "the streets and lanes and confines of the village in a state that would do credit to "many a municipality." It appears that the trenching of night-soil has been very

imperfectly carried out in many places, but the Sanitary Commissioner hopes to be able to report next year that it is properly trenched in all the municipalities.

The Sanitary Board held no formal meeting, owing to the great difficulty in arranging a time when all the members could be present together. The papers in particular cases were, however, circulated to each member for the record of his opinion, after which the necessary action was taken. The chief work undertaken by the Board was the preparation of a scheme for the supply of filtered water to Howrah. Owing to the expenditure having been at first limited to 12 lakhs of rupees, it was intended that the intake should be at Bellor, about two miles north of the town, but arrangements have now been made to take the water in at Serampore, nearly opposite to Government House at Barrackpore, where analysis shows the water to be of very good quality. It is hoped that the work will soon be begun and that before the end of 1895 the people of Howrah will have a supply of filtered water. Survey work for the drainage and possible sewering of Howrah is still being carried on. The Sanitary Commissioner and the Engineer to the Board were engaged for two months on a Commission appointed by the Government of Bengal to inquire into the purity of the Darjeeling water supply. The report of the Commission has been submitted to Government, and the consideration of the measures to be adopted is at present occupying the attention of the Board.

Approximate estimates of the cost of drainage schemes for Sasseram, Dainhat, and Baidyabati, were framed by the Engineer to the Board, but lack of funds has been pleaded as an excuse for not undertaking any work. The negotiations carried on through the agency of the Board to induce the municipality of Monghyr to join with the East India Railway Company at Jamalpur, in a combined water-supply scheme, have fallen through on account of the refusal of the municipal commissioners to vote funds. The drainage work at Burdwan has been stopped owing to the resignation of the engineer employed by the municipality, no one having been engaged in his place.

The sewering and drainage of Dacca, and improvements of the drainage of Jessore, and of the state of the River Bhyrub, and various schemes of less importance, have been considered by the Sanitary Board.

The total income of the municipalities, stations, unions, and towns in Assam, in 1893, was Rs. 1,91,612, showing an increase of Rs. 1,656, as compared with the previous year. The expenditure on sanitary works, including roads and bridges, was Rs. 1,22,944, or 60·07 per cent. of the income against 60·31 per cent. in 1892. On conservancy Rs. 49,833 were spent, on water supply Rs. 23,537, and on drainage Rs. 7,253. Excluding the expenditure on roads and bridges, 43·09 per cent. of the total income was spent on sanitary works. The towns in which the expenditure fell below this average were Gauhati, Barpeter, Sibsagar, Jorhat, and North Lakhimpur.

The most important sanitary works completed or undertaken during the year were (1) the completion of the Shillong waterworks; (2) improvement of the water supply of Gauhati; and (3) the commencement of a scheme for giving an abundant and pure supply of water to Sylhet.

In Shillong most of the householders have been provided with hydrants in their compounds, and four stand-pipes have been erected at different places for the public use. The supply of water is now good and abundant, except near the jail, where it is deficient. Funds have been placed at the disposal of the executive engineer for the purpose of cleansing the filter beds, but the funds at present are not sufficiently large to admit of the cementing of the filter beds or covering in the tanks.

At Gauhati the intake of the waterworks is at a point on the river below the town, and too near the bank, so that, when the water in the river is low, the supply is contaminated. It is proposed to obtain 1,600 feet of piping to allow of the pumping barge being anchored in the mid-channel, so as to ensure a pure supply. It is also proposed to obtain a spare engine, so that there need be no stoppages in the distribution of water.

At Sylhet the present supply of water is obtained from the river Surma and from tanks, and is generally bad. It is proposed to sink wells on a suitable site, and to raise the water from them by pumps to a reservoir to be built on an elevation from which, after proper filtration, it will be distributed by pipes and hydrants over the town. Owing to the length of the rainy season in Assam, and the consequent water-logged condition of many of the towns, the satisfactory disposal of night soil has been a matter of the greatest difficulty, and the general introduction of incinerators has been proposed. The Sanitary Commissioner, however, reports very unfavourably of the action of such incinerators as he has seen. The trenching of night soil was satisfactorily carried out

at Sibsagar, Jorhat, Tezpur, Goalpara, Dhubri, and Sylhet, but, although cultivation of the trenched land is proposed at Tezpur and at Dibrugarh, where the incinerator has been found a failure, it does not appear that at present the trenched land is anywhere cultivated. At Gauhati the night-soil is buried in pits.

The members of the Sanitary Board have not found it necessary to hold formal meetings, but all important correspondence relating to village sanitation is submitted to each member of the Board in turn for record of his opinion, or of any suggestions he may have to offer. The Board seem to have been mainly occupied in directing operations for the improvement of the water supplies of villages.'

The annual income of the 103 municipalities in the North-Western Provinces and Oudh in 1893 was Rs. 50,78,172; the expenditure on water supplies was Rs. 20,35,237, which includes the capital cost of certain large waterworks in process of construction during the year, on drainage, Rs. 1,06,776, and on conservancy, Rs. 8,04,438.

The following notes relate to only the principal sanitary works :—

(1.) The Cawnpore waterworks, of which the foundation stone was laid in March 1892, were nearly completed during the year.

(2.) The Lucknow waterworks were in progress, and Rs. 10,46,797 of the sanctioned estimate of Rs. 15,58,394 were expended up to the 31st of December. A length of about 33½ miles out of a total of 36⅝ miles of piping were laid, and it is expected that the works will soon be opened.

(3.) The Naini Tal waterworks were approaching completion at the end of the year, and although a plentiful supply of spring water was supplied in the lower zone of the sanitarium, the supply of the upper zone was inadequate, owing to defects in mechanical arrangements, which require modification to meet requirements.

(4.) The Mussoorie waterworks were opened in May, and continued working only for a short time.

(5.) The project for the Dehra and Rajpore waterworks has had to be postponed in execution, owing to litigation as to the terms of purchase of the source of supply.

(6.) A scheme for the supply of the city and cantonment of Meerut was formulated, and preliminary reports were submitted and considered.

(7.) At Agra, where the waterworks were opened in December 1890, filtered Jumna water was supplied uninterruptedly to the city during 1893. A total of 671,553 gallons per diem was supplied from the clear water reservoir, and, although this quantity amounts to only 6·71 gallons per head of the population, there is every reason to believe that the demand will increase as the prejudice against the use of water supplied in pipes disappears. Chemically and bacteriologically the water, as supplied, was good throughout the year. In water taken from the stand-posts 32 microbes per cubic centimetre were counted, as against 1,372 per cubic centimetre in the river water.

(8.) In Allahabad, from the 20th of July, the water supply was made constant to city and cantonment. The water was analysed weekly, and was found uniformly pure. Allahabad possesses an excellent drinking supply, but the objectionable open wells that still exist in the city are sources of danger.

(9.) The Benares waterworks were opened in November 1892, and during 1893 700,000 gallons were supplied daily, or 3·78 gallons per head of the population. Although the amount of water consumed per head is small, still the number of house connections, 1,548, is relatively large, compared with 430 in Allahabad and 445 in Agra. Since the introduction of the pure potable water supplies, the reduction in the death-rates of Agra and Allahabad have been remarkable; and no doubt were the statistical records for Benares in former years even approximately accurate, a similar result would be observable there.

(10.) At Benares the sewerage works were in progress, and a portion of the main sewer had been completed before the end of the year. It is expected that the work will progress rapidly.

(11.) The Cawnpore sewerage scheme met with considerable opposition on the question of the disposal of the sewage. On the 13th of November, a Committee, under the presidency of the Sanitary Commissioner with the Government of India, assembled at Cawnpore, and the conclusions arrived at were recorded for the information of the Government of India. In the meantime the drainage of the Sadar Bazar has been taken in hand.

(12.) The Naini Tal sewerage works were completed during the year, but some minor improvements are necessary. The outfall was unsatisfactory, inasmuch as crude sewage was discharged into a water-course flowing through an inhabited valley. Steps have been taken to ensure that the effluent liquid will be comparatively pure before reaching the stream.

(13.) Certain of the recommendations made by the Committee appointed to advise on the remedies to be employed to improve the sanitation of Hardwar were carried out, and on the 2nd of April the Lieutenant-Governor inaugurated the important sanitary works which had been completed. The improvements comprise the carrying of the sacred steps outwards to an extent that will admit of every portion of the sacred ghat being swept by the Ganges, a portion of the stream for some distance above the sacred pool being confined to a definite channel; the bottom of the sacred pool has been paved, and a large outlet constructed to allow the water to flow away in an uninterrupted current to the river; the sacred tank at Bhim Goda has been enlarged, paved, and provided with a strong current of water direct from the Ganges.

(14.) Defects in general drainage in a great scale, as in the case of the Kali Burhganga Doab, have been, or are being, remedied. It is estimated that Rs. 30,00,000 have been expended by the Irrigation Department alone in improving the drainage of tracts injuriously affected.

The Sanitary Board met several times at Naini Tal during the summer, and once at Allahabad, on the 1st of December. In March the Board were asked to frame rules for the working of the North-Western Provinces and Oudh Village Sanitation Act (II. of 1892). Certain rules (under sections 14, 15, and 20, clause 1 (*a*) and (*b*), and clause 2 (*a*) to (*e*)) were approved by the Board at their meeting in December, while other rules (under section 20, clause 2 (*f*), (*g*), and (*h*)) are still under their consideration. The Board submitted opinions on cases in connection with the obstruction of drainage in non-canal districts. By a resolution of the Local Government dated 21st December 1893 a change was made in the constitution of the Board; the Director of Land Records and Agriculture and the Legal Remembrancer were relieved of their duties, and the Sanitary Engineer to Government was appointed a member and secretary.

The income of the 149 municipal towns in the Punjab in 1893 was Rs. 40,64,553, and there was an opening balance of Rs. 8,74,307 from the previous year. The expenditure incurred on sanitary works, including expenditure on roads and bridges and the paving of streets, was Rs. 10,15,980, or Rs. 4,56,451 less than in 1892. The expenditure on water supply, including the cleansing of tanks, was Rs. 2,15,636, as compared with Rx. 5,86,041 spent in 1892, and on drainage and sewerage Rs. 77,171 against Rs. 1,29,853. There was a decrease in the amount realised by the sale of manure and town sweepings, the sum obtained in 1893 having been Rs. 1,13,773, against Rs. 1,28,804 in 1892, and Rs. 1,24,804 in 1891. The principal sanitary works finished, undertaken, or contemplated, are here noted. The Umballa city waterworks, estimated to cost Rs. 3,16,000, were put in hand, and materials required for the works are being collected. The Simla water supply extension was practically completed. The water supply works for the town and cantonment of Kohat were completed. The waterworks at Dalhousie and Murree were nearly completed, and progress was made with the water-supply works at Dunera in the district of Gurdaspur. The scheme for the supply of water to Amritsar is still being considered, and a project for a new water supply for Haripur in the Hazara district was prepared and submitted to the Local Government.

Projects for the drainage of Anarkali, and for the improved intra-mural drainage of the city of Lahore, were submitted to the Local Government for approval. In Simla Rs. 1,11,869 were spent in connection with the sewerage extension, and the Boileauganj sewage line was completed and brought into use in June 1893. The Ludhiana drainage

scheme was completed at a cost of Rs. 1,42,078. The intra-mural drainage of Gujranwala town was still in progress. Work on the drainage scheme for the town of Dera Ghazi Khan has been begun; but the project for the combined city and cantonment drainage scheme at Rawal Pindi, as well as the schemes for Ferozepore and Muzaffargarh, were still under consideration.

The Sanitary Board met twice during the year, once at Lahore and once at Simla. The principal subjects considered by the Board during the year were: (1) the proposed Jhelum drainage scheme; it was arranged that the joint opinion of the Commissioner of the Rawal Pindi Division and of the Superintending Engineer should be given to the Board after reconsideration of the project on the spot. The Commissioner informed the Board that, on account of the destruction caused by the floods in July 1893, the river now runs close under the walls, and the municipal income is so reduced that no general drainage scheme is at present practicable; (2) a report by the Sanitary Commissioner regarding the defective drainage of Mooltan; extracts from the proceedings of the Board were sent to the Commissioner, Lahore Division. The municipality of Mooltan have since carried out most of the recommendations made by the Sanitary Commissioner.

The total income of the 19 municipalities in the Central Provinces in 1893 was Rs. 16,78,720; and of this, Rs. 39,114 was spent on water-supply, and Rs. 1,94,391 on conservancy.

The most important sanitary works completed, or under consideration, were the following:—

(1.) At Raipur, the Balram Das Waterworks.—In the original estimate, provision was made for the construction of a low dam across the river, about 200 yards lower down than the galleries, in order to maintain the water-level, but during the construction of the works the supply of water in the galleries was so abundant that it was resolved, before constructing the dam, to ascertain whether the water-level would not remain sufficiently high during the hot weather without it. In the summer of 1893, however, it was found that the infiltration of water into the galleries was insufficient to keep up the supply of water required. Work was therefore immediately undertaken on the dam, which, it was expected, would be finished by the end of May 1894. The expenditure on the works during the year was Rs. 71,146.

(2.) The Raj-nandgaon Waterworks.—Owing to the situation of the town, a gravitation scheme was found to be impracticable, and a pumping scheme had to be adopted. The foundation-stone of the work was laid by the Chief Commissioner on the 7th of December 1892, and the works were opened on the 19th of January 1894. The water is collected by infiltration into five wells, constructed in the north bank of the Sheo Nath River, at right angles to its course. The wells are connected with each other by a double series of pipes, so that the supply of water can be drawn from one well. The pumping machinery is duplicate, and is designed to pump 96,000 gallons in 10 hours. The water is pumped to a service reservoir which holds 144,000 gallons, near the town, through a 7-inch main, 2½ miles long. From the reservoir the distribution to the town is by a system of cast-iron pipes and self-closing water fountains. It is estimated that the present five wells will supply 80,000 gallons in the 24 hours, and a sixth well is to be added, which, it is expected, will increase the amount to 96,000 gallons. The water supplied is clear and good, and is so greatly appreciated by the people of the town that they have entirely given up the use of tank water for domestic purposes. The total expenditure on the work during the year was Rs. 1,07,112.

(3.) At Jubbulpore, extension of the water-supply works is being considered; but so far the estimates for the necessary work have been in excess of the 2½ lakhs of rupees, which is the utmost amount that the municipality are prepared to spend on the project.

The Sanitary Board, which consists of the Sanitary Commissioner and the Chief Engineer, together with the Commissioner of the Division, and the Deputy Commissioner, Civil Surgeon, and Chairman of the District Council of the district in which the Board is sitting, met 14 times during the year. The main work of the Board was the direction of village sanitation.

The number of municipalities in Berar was increased by three in 1893, the total number being now 11. The new municipalities are Yeotmal, Buldana, and Ellichpur Camp. The estimated income of all the municipalities, excluding opening balances, was Rs. 3,68,611, of which 45·7 per cent. was spent on water supply, 16·6 per cent. on conservancy, and 2·7 per cent. on drainage. The principal sanitary projects are here noted: In Amraoti town, a drainage scheme, costing Rs. 4,86,933, has been approved by the Municipal Committee. It is proposed that the drainage, which consists almost entirely of house sullage and waste, should be used on farm irrigation. In Akola the sum of Rs. 1.46,000 was contributed towards the cost of the Kapsi water supply, now approaching completion. It was originally intended that Akola should be supplied with water by gravitation from a tank at Kapsi. A system of underground galleries have, however, been substituted for the tank, pipes have been laid, and it is expected that an unfailing supply of water will be delivered in Akola very soon. The drainage of Akola is very defective; and, as the Sanitary Commissioner remarks, the new water supply will not prove an unmixed blessing if the added water brought into the town cannot be got rid of. The municipality are alive to this, but seem to be unable to provide the funds for a scheme for delivering the drainage where it will do no harm, at a distance from the town. In Khamgaon, a sum of Rs. 4,069 was spent for the up-keep of the Janona waterworks, but the question of filtration of the water has been abandoned for the present. The drainage of this town is being steadily carried on to completion. At Shegaon, the completion of the system of drainage is steadily progressing. The total expenditure incurred by District Local Boards, on works of sanitary improvement was Rs. 93,578, against Rs. 1,48,571 in 1892.

The members of the Sanitary Board assembled six times during the year, once at each district headquarters. The Board considered the several recommendations made in the sanitary surveys of towns and villages, and recorded such remarks as seemed necessary for the guidance of the local bodies concerned, ascertained what progress had been made in the completion of schemes proposed at previous meetings, and reviewed the reports submitted by village Sanitary Boards.

The total estimated receipts of the towns in Madras for 1893–94, excluding the presidency town, were Rs. 27,47,600, and of this amount Rs. 14,53,446, or 52·8 per cent. was set aside for expenditure on sanitation, the actual outlay during the first nine months of the year having been Rs. 10,27,144. Of this sum Rs. 4,30,719 were spent on water supply, excluding the amount spent for waterworks in Tanjore; Rs. 3,51,253 were spent on conservancy, and Rs. 1,55,507 on the improvement of village sites.

The following were the important sanitary works of the year:—Seven schemes for the supply of water, and two for drainage, at an estimated cost of Rs. 16,40,000, were in hand. Of these, the Cuddapah water supply and the Coonoor drainage works were completed, and very little remained to complete the drainage project of Kumbakonam. Fair progress was made in the schemes for the water supply of Madura, Tanjore, and Trichinopoly, though the works in the last two towns suffered heavily from the floods in November. Schemes for the water supply of Conjeeveram and Tuticorin, and the drainage of Karur, are under the consideration of Government.

With a view to assist municipalities in financing their schemes, Government contemplates raising the house and water taxes by making necessary amendments in Act IV. of 1884.

In the matter of night-soil and rubbish conservancy, and petty improvements of water supply, pending the execution of larger schemes, the Sanitary Commissioner reports that a steady advance has been secured during the year. In no municipality, however, can night-soil conservancy be said yet to be perfect. The advantages of sewage farming have been steadily pressed on the attention of municipalities, but on account of caste prejudices progress in this direction must be slow. Sewage farming is profitably carried on in Madras and Tanjore, and in Negapatam it was commenced on a small scale during the year.

The total estimated income of the districts for 1893–94 was Rs. 78,93,344; of this sum Rs, 6,27,907, or 7·9 per cent. was assigned to sanitation, and during the last nine months of 1893, 55·4 per cent. of the allotment was expended.

In Coorg, in 1893, Rs. 528 was spent by the Public Works Department, and Rs. 11,010 by the municipalities, on Sanitary works; of this Rs. 10,000 was a contribution towards the cost of the water-supply works for Merkara, which, it is hoped, will be opened before the end of 1894. There were two meetings of the Sanitary Board. At the first it was resolved to strengthen the Board by the appointment of a member of the planting community. This proposal having been sanctioned by the

Chief Commissioner, a planter member was present at the second meeting. The chief work of the Board was the consideration of measures to be adopted for the better conservancy of coolie lines on the plantations.

In the beginning of 1893 the members of the Bombay Sanitary Board travelled through Sind, and gave advice to the municipalities of Jacobabad, Shikarpur, Sukkur, Hyderabad, and Karachi. On conclusion of their tour in Sind, they passed through the Deccan, and inspected the sanitary condition of Sholapur, Bijapur, Gadag, Barsi, Belgaum, and Ahmednagar. In the Konkan they visited Kalyan, Thana, Nowpara, and Murbad.

During the year the Board advised concerning improvements in the water supplies of Poona, Kirkee, Jacobadad, Shikarpur, and Hyderabad; they suggested alterations in the new projects for the supply of water to Nipani, Kalyan, Panvel Yellamma, Yeola, Dharwar, and Sukkur; they pointed out serious defects in the scheme for the supply of Sangola, approved of the plans and estimates for the supply of Murbad, and suggested a scheme for the improvement of the water supply of Nasik. Besides giving advice regarding the drainage of Hyderabad, Sholapur, Bijapur, and Karachi, the Board gave their opinion regarding the general sanitary details of a large number of miscellaneous projects.

The Board drew out a plan intended to show the general lines on which rubbish and night-soil depôts should be laid out, and distributed copies of the plan to the different municipalities. Copies of a plan for a slaughter-house for small towns were similarly distributed.

In Burma, in 1893, the amount of expenditure incurred by the Public Works Department on sanitary works was Rs. 81,323; of this Rs. 35,863 were spent on water supply, and Rs. 29,619 on drainage. The particulars supplied regarding expenditure by municipalities are insufficient to admit of the formation of an estimate of the proportion allotted to sanitation. The more important improvements effected during the year appear to have been the following:—

In Rangoon works were in progress with a view to supplying water under increased pressure. A reservoir is being constructed on Pagoda Hill, capable of holding 1,000,000 gallons; to this water will be pumped up, and thence it will gravitate to supply the city and cantonment. The reclamation of the low-lying lands to the east of the city was being continued. The Shone and Ault system of sewerage has now been working for three years, and there are upwards of 1,500 house connections, 416 connections having been made in 1893. In the outlying parts of the town considerable progress has been made in conservancy and drainage, but the objectionable tanks situated in the middle of the city have not yet been filled in.

In Moulmein a conservancy scheme has at last been adopted, cess-pits have been closed in the fourth division of the town, depôts established, and the night-soil conveyed and buried outside municipal limits; a scavenging tax has been imposed, and the system will be extended gradually. None of the various schemes proposed for the supply of water have been adopted, the cost of each being considered prohibitive. In Akyab proposals for an improved system of conservancy have been formulated. In Mandalay, where the water supply is of doubtful quality and frequently deficient in quantity, filter wells have been sunk in an old dried up bed of the river, and it is intended, if the supply of water derived from there is sufficient, to pump it to an elevated reservoir for the supply of the city. A scheme to do away with cess-pits and properly conserve the town by the construction of latrines with moveable receptacles, to be conveyed weekly outside the city by means of a tramway, is being considered by the local Government.

The number of meetings of the Sanitary Board is not stated in their report. The appointment of a Sanitary Engineer is still deferred, pending the completion of the surveys of selected towns, the consideration of which seems to have mainly occupied the Board during the year.

General Remarks.

Cholera in the Persian Gulf.

The following details regarding cholera on the shores of the Persian Gulf in 1893 are taken from special reports furnished by the agency surgeons of Bushire and Baghdad.

Cholera appeared at Basrah on the 27th of May, and was present in the town until the beginning of November; but there were short periods of quiescence, and the disease does not seem to have been at any time severely epidemic.

At Zubair, in the desert, 10 miles south-west of Basrah, the disease broke out on the 31st of May, and at Shatra on the 2nd of June; at Muhammara and Fao it was present on the 8th of June, and at Abul-Khasif on the 10th. On the 10th of June suspicious cases occurred at the quarantine stations of Kut-al-Amra, and the Lazaretto was moved about 100 yards up the stream. On the 19th of June the disease appeared among the Arab tribes camping on the Euphrates. On the 8th of July it broke out at Al-Katif on the Arab coast of the Persian Gulf, and it appeared in a severe form at Bahrain on the 21st. On the 6th of August it broke out at Al-Hasa, Ojair, and surrounding places. An outbreak was reported at Al-Bida on the 30th August and at Abu Dthabi on the 20th of September. The disease seems to have travelled down the Oman coast as far as Ras-El-Khaima.

On the Persian coast it appeared at Bunder Dilam on the 2nd of September; on the Island of Kais on the 3rd, at Charak and Bunder Bostanah on the 14th, and at Singah on the 28th of September. Minab and the district around were attacked on the 3rd of October, and Bunder Abbas on the 15th. Bunder Rig was attacked on the 17th of September. On the same date the disease appeared at Ahmedi, and it broke out at Borasjan on the 20th of September, and at Daliki on the same day. On the 6th of October it was reported that 500 deaths had occurred up to that date at Kazaran; it is stated that the epidemic had entirely ceased in that part of the country on the 7th November.

In spite of the facts that Bushire was in constant communication with the infected places, and that a few cases occurred among the shipping and in the outskirts of Bushire, only one case occurred in the town itself. This immunity is attributed by the Agency Surgeon, in part to the elaborate precautions taken to prevent the importation of cholera, but mainly to the excellent supply of pure drinking water.

"On July 27th, Basrah having been returned as free from cholera since the 10th, passengers by river were allowed to come to Baghdad, subject to a detention of 10 days at Kut-al-Amra Lazaretto, where a large number of persons had collected during the previous weeks on their way up to Baghdad.

"Cholera attacked Sukhus Shuikh on the Euphrates on July 29th, and 49 deaths were reported from that date to 16th August inclusive. It proceeded thence along the right bank of the Euphrates towards Nasrieh and was first reported from the latter place on 25th August, the disease meanwhile continuing to manifest itself at Hye and Shatra, though the mortality reported was not great.

"On the 24th August the disease first appeared in this city (Baghdad), 28 days after the withdrawal of the prohibition of passenger traffic by the river steamers, ten days after the arrival of the first, and eight days after the arrival of the second, of these steamers; each of which conveyed hundreds of Jewish pilgrims returning from their annual visit to the tomb of Ezra by way of Kut-al-Amra and Basrah.

"In Baghdad the disease first broke out among the troops in the Turkish quarter, where there were four cases on August 24th, and this was first notified in the official bulletin of the 26th. On the 25th there were six attacks amongst the troops and two cases in the city, giving 12 cases with three deaths for the first two days. On the 27th it appeared in the prison, lasting till the 1st of September and causing four deaths, and on that date the prison was evacuated, all prisoners being liberated on insignificant bail.

"The mortality was thus low for the first three days, after which it rose rapidly, reaching 38 on the 31st August, and 57 (the highest number reported) on the 6th September. After this it slowly decreased, and the city was reported free from cholera mortality for the first time on October 1st, when the epidemic here may be considered to have terminated, though sporadic cases continued to occur at intervals for a considerable time."

The Haj of 1893.

The great day of the Haj fell upon a Friday, and 1893 was an Akbar year. The Haj took place on the 23rd of June, and the numbers attending it were the greatest ever known. It was signalised also by the severest epidemic of cholera on record. Deaths are said to have occurred at the rate of 1,000 a day for some weeks, and the numbers of the dead were so large that the Turkish troops had to bury them, while the stench of decomposing corpses is said to have been perceptible in the Red Sea, 60 miles away. The total number of deaths is estimated at from 40,000 to 45,000, but some of the medical officers of ships that were at Jeddah during the height of the epidemic, consider that the mortality ascribed to cholera was exaggerated, and point out that the large numbers of pilgrims in excess of the average led to

scarcity of food and water; moreover, the season was unusually hot, and there was scarcity of rain. Many probably died of starvation and exhaustion. The number of eastern pilgrims who left Jeddah, as estimated by the British Consul there, fell short of the number who arrived by 13,076, of whom 3,420 were Indians and Afghans; he believes that three-fourths of the missing died during the cholera epidemic.

Pilgrims from India.

The measures adopted for the medical inspection of pilgrims leaving Bombay are these. Six hours before the departure of the vessel the pilgrims are allowed to go on board. Having deposited their baggage, all males, except children and the old and weakly, are caused to leave the vessel, which is then moved away to a little distance from the wall of the quay. Those remaining on board the ship are then carefully examined by the Port Health Officer, assisted by the ship's doctor. This examination completed, the men then re-embark and are examined one by one. Besides the Port Health Officer, there are present the protector of pilgrims, a large number of police, and the Customs officials, who are responsible that the ship is well found and that the number embarked is not in excess of the number for which there is the accommodation laid down by law. Medical officers of pilgrim ships are legally bound to keep a diary of each voyage, containing an admission and discharge book, and a register of deaths. On the outward voyage the diary is handed to the Consular authority at Jeddah, and is by him forwarded to the Government of India. The Bombay authorities furnish each vessel with two copies of the diary for the outward voyage, one of which it is intended should be returned to Bombay, but, as the medical officer is compelled to keep only one diary, if the vessel does not return to Bombay the duplicate is sometimes not received.

The average number of pilgrims who have left Bombay annually during the last nine years has been 12,500, and the usual proportion not accounted at the end of the return voyage is 33 per cent. In 1893, on account of the Akbar year, the number rose to 20,068. Thirty vessels left Bombay for Jeddah, which with the exception of one outsider, "The Knight of St. John," were of the class usually engaged in the Red Sea pilgrim traffic. "The Knight of St. John" is reported, by the Port Health Officer of Bombay, to be superior to the majority of pilgrim ships, which also are stated to have been greatly improved of late years, the owners having met in a friendly spirit the suggestions made to them regarding the improvement of their vessels. The sanitary state of the ships before the pilgrims embarked is reported to have been good, but this condition does not seem to be long maintained. Ventilation has been improved, but is still bad on account of the difficulty of sufficiently ventilating by natural means the 54 cubic feet of space allotted to each pilgrim. This amount of space is further curtailed by the room taken up by baggage. Moreover, the capacity of a ship is calculated on the total available superficial area, and, as the first and second class accommodation is rarely fully occupied, more third class passengers are embarked than the space set aside for them warrants.

During 1893 the number of deaths from cholera in Bombay city was 147 against 169 in the previous year, and in neither year was quarantine against Bombay at any time in force at Suez.

Quarantine at Camaran.

The lazaret had been in use from the beginning of September 1892, when cholera broke out among the Turkish soldiers in the Yemen, and it continued to be a military quarantine station until about the middle of the following January, when the Turkish Government ordered the soldiers to vacate Camaran and do their quarantine at Beyrout. It is not stated how many, if any, Turkish soldiers suffered from cholera at Camaran, but it seems that an officer was specially sent from Constantinople, in November, for the purpose of carrying out disinfection thoroughly. The lazaret was opened for the use of pilgrims on the 5th of January, 45 vessels arrived at Camaran during the season, and 31,788 pilgrims underwent quarantine against 23,986 in 1892; there were 14,291 Indians and 459 Afghans, against 9,719 and 305. The first vessel arrived on the 17th January with 276 pilgrims from Java; the first vessel to arrive from India was the S.S. "Tanjore," with 1,014 pilgrims. There were 116 deaths at the quarantine station. The chief diseases were cholera, small-pox, debility, diseases of the chest, and dysentery. There were also a few cases of influenza. Of the deaths, 25 were due to cholera, and 13 to small-pox.

On the 11th of March the S.S. "Sultan" arrived from Calcutta with 721 pilgrims on board. The medical officer reported that on the 25th of February, two days after leaving Calcutta, one person was attacked with cholera and died the same day. The pilgrims of this steamer were consequently sent to the cholera camp. One suspicious

134527

case occurred the same day, but recovered. After 18 days' quarantine the steamer, with its pilgrims, left with a clean bill of health for Jeddah.

On the 7th of May the S.S. "Knight of St. John," with 1,054* pilgrims (including 330 Indians and 680 Bokharans), arrived from Bombay, whence she had sailed on the 28th of April. There had been five deaths, two of which were due to diarrhœa, on the voyage. On the 10th of May the presence of cholera was suspected among the pilgrims who had arrived in this ship, and on the 14th of May there was an undoubted case. The pilgrims were at once moved into cholera camp, where special arrangements to give ample space to each pilgrim were made. There were 34 cases of cholera in all, 17 Indians and 17 Bokharans, 13 of the former and 12 of the latter died. The occurrence of the last case was reported on the 23rd May, after which, under instructions from Constantinople, the pilgrims were detained in quarantine for 15 days before being allowed to leave for Jeddah, where they were detained for another five days under medical observation. Regarding the origin of the cholera in the Hedjaz, the Sanitary Commissioner of Bombay remarks, "As usual India was given "the credit of starting the epidemic, on what grounds it is not easy to understand, "considering that cholera had for some time previously been endemic, and at times "severely epidemic, in parts of the Red Sea coast, and that some of the villages in "the French, Italian, and Somali settlements on the Red Sea had been almost "depopulated by cholera the previous year." It is stated that the Turkish troops, Anatolians, who suffer a good deal from the climate, really brought the cholera from Yemen to Mecca; and there is no doubt that cholera broke out among the Yemenies at Mecca before the arrival of the "Knight of St. John" at Jeddah. Dr. Tameez-ud-deen, Her Majesty's Vice-Consul at Hodeidah, in his report on the quarantine station at Camaran, for 1893, writes: "As this year there was cholera in Russia before the "departure of the above-mentioned steamer from Bombay, we could not be sure "whether cholera was brought up to Camaran from Russia or India." However that may be, we may agree with him when he says, "no one can say with certainty that cholera is, invariably, imported into Mecca from India."

The return of pilgrims to India.

There were 16 steam ships arrived in Bombay with returning pilgrims. The number of pilgrims who embarked for Bombay at Jeddah was 11,466, and 43 embarked at intermediate ports. There were three births on the voyage, 9,015 souls landed at Bombay, and 2,290 at Aden and Karachi. There were 207 deaths at sea. Cholera broke out on four of the returning vessels; there were 23 cases and 21 deaths, but the disease in each case died out before the arrival of the affected vessel in Bombay, and the arrival of the pilgrims had no effect on the cholera mortality of that city. The chief causes of death on board the returning vessels were general debility (55), old age and debility (31), simple continued fever (18), and debility and diarrhœa (14). The mortality on some of the ships arriving in July was very great, certainly the mortality on the return voyage is generally greater than on the outward; the pilgrims are in an enfeebled state of health, and as most of the voyages are made during the south-west monsoon, they are forced by the weather to leave the upper deck and huddle in the ill-ventilated 'tween decks. Calculated on a 14 days' voyage, the mortality of the pilgrims on the return voyage, in 1893, was equal to a ratio of 468 per 1,000 per annum, by far the greatest mortality on record.

Researches by the Special Assistant.

The work which was carried on during the course of the past year in the laboratory attached to the office of the Sanitary Commissioner with the Government of India, consisted in greater part in investigations into the actual efficacy of various alleged remedies for cases of snake-bite, and in a series of experiments on the effects of the habitual use of hemp drugs.

Snake venom.

The principal alleged remedies for snake-bites which were tested were strychnia, saturated solutions of periodate crystals and 1% solutions of gold-chloride as originally recommended by Calmette. In order to secure accurate data in regard to the efficacy of these drugs when administered after lethal doses of venom have actually entered the system, a large stock of cobra venom was collected from many distinct snakes, and after having been carefully dried, was mixed and triturated to an impalpable powder, yielding constant results when employed in given quantities according to the weight of the animals which were made the subject of experiment. The minimal lethal doses for fowls and monkeys were then accurately determined, and the effects of the various alleged remedies carefully tested after such doses had been introduced in the system by the hypodermic injection of solutions containing them.

* 1,021 according to the Bombay authorities.

The results of the experiments clearly showed that the injection of repeated doses of nitrate of strychnia have no effect whatever in preventing the occurrence of death after even nominal lethal doses of cobra-venom have entered the system. There could be no question in regard to the potency of the nitrate of strychnia which was employed, as the results of repeated special experiments conclusively demonstrated, and there was no evidence whatever that the administration of the drug in any way affected the development of the phenomena normally following the introduction of the venom, save in cases in which it was carried so far as to give rise to a tendency to the development of tetanic symptoms. On the other hand, there was no evidence of any special intolerance of strychnia—no evidence of any special liability to poisoning by it—in the animals which were employed, so that nothing came in to interfere with the administration of frequently repeated doses, proportionate weight for weight, to those which are alleged to produce curative effects in the human subject. The alleged cures of snake-bite by means of repeated injections of strychnia must, therefore, in the light of these experimental data, be accounted for as having occurred in cases in which even minimal lethal doses of venom had not entered the system. It is, however, possible that the treatment may be of some positive value in such cases, as it appears not improbable that in certain instances death may ensue in them as the result of the co-operation of nervous depression originating from mental causes with the specific toxic effects of the poison, but it is clear that in so far as the latter are concerned the treatment has no effect whatever.

Saturated solutions of periodate crystals proved equally inefficacious. Even in cases where they were employed as the vehicles for the solution of minimal lethal doses of venom which were subsequently injected, they in no way appreciably delayed or modified the development of the normal toxic phenomena, and this being the case, it was of course only natural that they should fail to do so when administered separately and after the venom had already entered the system.

This is not, however, the case in regard to 1% solutions of gold-chloride, for when mingled with the venom previous to injection they render it inert and they are also efficient remedies against minimal lethal doses of it even when administered after the latter have entered the system for some time and when introduced at sites remote from the point of entrance. Their efficacy unfortunately ceases here; it is only against minimal lethal doses that it exists, and no increase in the amount of the gold salt introduced suffices to prevent the occurrence of death where the amount of venom which it has to contend with exceeds a minimal lethal dose. Calmette now recommends solutions of the alkaline hypochlorites and specially the serum derived from animals which have been rendered exempt from the action of venom as more efficacious than gold-chloride, and the effects of these will presently be tested, but in so far as gold-chloride is concerned, its curative properties can only be regarded as matters of laboratory interest of little or no value in regard to the practical treatment of cases of snake-bite.

In connection with these experiments with cobra venom a certain number of others were conducted with the poison of Russell's viper. Certain very curious results were obtained demonstrating the essential difference that exists between the actions of the two poisons, but the amount of viper poison which was at the time available did not permit of the investigation being satisfactorily concluded. A large number of vipers have, however, been since acquired and kept in the Reptile-house of the Zoological Garden at Alipur and a very considerable supply of poison has been gradually accumulated so as to afford ample material for future experimental work.

Hemp drugs.

The general results of the series of experiments on the effects of continued habitual exposure to the action of hemp drugs have already been communicated to the Indian Hemp-drugs Commission, at whose instance the investigation was undertaken, and were of interest in so far as they appear to indicate that the habitual inhalation of the smoke of ganja may under certain circumstances be positively beneficial in place of deleterious. The animal—a specimen of the common monkey (*M. rhesus*)—which was subjected to frequent inhalations of the smoke of ganja for a continuous period of more than eight months remained in excellent general health, save for occasional disorders such as any caged monkey is liable to, and the only persistent phenomenon which it presented, which could be reasonably regarded as induced by the treatment was a considerable diminution in appetite for food. In spite, however, of the diminished ingestion of food which this gave rise to, no considerable and proportionate emaciation took place, and, on the contrary, when the animal was killed and a *post-mortem* examination of the body conducted, fatty accumulation in the tissues of the peritoneum and elsewhere was found to be present in exceptionally large amount

for a caged monkey. The phenomena thus appeared to indicate that habitual inhalation of ganja gives rise to a reduction in waste of tissue, and, if this be really the case, it becomes at once evident that the habit may be beneficial to people who are obliged to undergo habitual exertions without being able to obtain a diet of such quality as to adapt it to make good the amount of waste of tissue normally incident on these.

Evolution of red blood cells.

In addition to this experimental work, and as a necessary preliminary to the satisfactory study of the alleged parasitic origin of malarial fevers, a study of the structural features, presented by the tissue of the red marrow of the bones of various species of animals as the great site of manufacture of the red corpuscles of the blood, was undertaken. A considerable amount of time was devoted to this subject, as unless any one is thoroughly familiar with the appearances of the red corpuscles of the blood during the earlier stages of their evolution, appearances dependent on the access of immature corpuscles to the blood-stream must be liable to be confounded with those connected with the presence of intrusive protoplasts of parasitic nature.

NOTE ON THE INFLUENCE OF RAILWAYS IN THE DISSEMINATION OF CHOLERA.

By Surgeon-Major J. Lewtas, M.D., Officiating Statistical Officer to the Government of India in the Sanitary and Medical Departments.

Any influence which railways may have in promoting the spread of cholera would be expected to show itself in one or both of the following ways:—

(1.) By a more rapid extension of epidemics, as compared with those which occurred before railways were opened, the extension taking place especially along lines of the railway which pass through centres of the disease;

(2.) By disproportionate prevalence of the disease in places lying on or near to lines of railway.

An examination of the history of epidemics of cholera both in India and Europe shows that railways have had little, if any, effect upon their progress. Obviously individual cases have been carried further than would have been possible before the introduction of railways; for example, a man may have imbibed cholera poison just before taking his seat in a train, and may travel 200 miles or more before symptoms are developed, whereas, before the days of railways, he would not have gone further than 10 or 15 miles in a bullock-cart. But such cases as this do not appear to affect the subsequent course of the epidemic; they neither accelerate its progress nor determine its direction. During recent epidemics of cholera in Europe, it frequently happened that individuals travelled considerable distances by rail from the place at which they had received the infection before the disease showed itself in them, without any other case occurring in the towns or villages where they eventually either died or recovered. To quote two instances in India: at Meerut, in 1869, a sepoy was removed moribund from a railway carriage, and was carried to the lines of the 36th Native Infantry Regiment before he died. But no other case occurred amongst the native troops at Meerut until a fortnight later, when the advancing epidemic reached that place (*see* Dr. Bryden's report upon the cholera epidemic of 1869, page 53). Again, on the 14th April 1893, five men attacked with cholera were removed from a train at Saharanpur. Three of these died, but no epidemic ensued in Saharanpur.

The history of epidemic cholera in India does not show that the disease advances along lines of railway rather than by other roads. Sometimes, on the contrary, a line of railway remains outside, although close to an epidemic area. The map of the epidemic of 1869 is a very striking illustration of this. The disease that year attacked Allahabad on the 21st March, advanced slowly to Delhi, keeping almost exclusively to the south and west of the railroad, until at Delhi it left the line altogether and travelled to Lahore by way of Hansi and Hissar, parallel to, but distant a hundred miles from, the line. The country between Meerut and Amritsar, 250 miles in length, although traversed daily by trains, remained absolutely exempt from the disease. It is a fact, be the explanation what it may, that during the epidemic of 1869 there existed a large area of country extending from Shajehanpur to Amritsar, 400 miles in length, traversed by every means of communication, and in which Hardwar itself is included, which, nevertheless, was free from the cholera which was prevalent in adjoining districts. Other similar instances are to be found in the rather bewildering

pile of literature which has grown up regarding cholera in India. I will mention only a few: "in 1875 cholera advanced from Agra to Delhi, but no place on the line of railway between Delhi and Lahore was attacked"; again, in 1879, it was noted, with the additional remark that the fact was by no means peculiar to 1879, that "all "along the Great Indian Peninsula Railway line, where the traffic is greatest, there "was no cholera at all" (*see* report for 1879 of the Sanitary Commissioner with the Government of India, page 127). An examination of the map contained in the report of the Sanitary Commissioner, Bombay, for the year 1883, when cholera was epidemic in that province, shows that, although the first case at Ahmedabad occurred on the 23rd August, yet there was no case at Broach, which is only 120 miles from Ahmedabad and in direct railway communication with it, until the 29th September, between five and six weeks later. Facing the map in that report there is a table giving the dates of first cases at different stations, and an inspection of this table shows clearly that the epidemic spread in a most erratic fashion, and was quite uninfluenced by the network of railways in its neighbourhood. The first case in Poona city was on the 6th April, but there was no case at Kirkee, distant only about three miles, until the 21st June. Observers of cholera epidemics in other countries also have been struck by the very erratic manner in which the outbreak extends. In the voluminous official reports of the cholera epidemic in the United States in 1873, it is again and again remarked that the disease showed no rule or regularity in its mode of progress. For example, at page 342 it is stated that "cholera in its travels northward frequently "avoided one commercial point to settle in another and more distant one, although "communication by steamboats and other modes of travel was uninterrupted. At "later periods it broke out at some of the points which had been thus passed." For instance, the epidemic was in New Orleans in the beginning of February 1873, but it did not attack Chicago until June, and the town of Cleveland, intermediate between New Orleans and Chicago, was not involved in the epidemic until two months after it had appeared at Chicago. After giving other illustrations of its erratic progress, and instances also of its synchronous appearance in places remote from each other, the report goes on to state that "no connexion could be established between the first fatal "cases of cholera and any steamboat landing, railroad depôt, imported cholera patient, "or person from a locality where the disease had been prevailing."

Again, there is, as a rule, disproportionate prevalence of cholera during an epidemic at places lying on a line of railway. In considering this question, it must be borne in mind that railways usually connect the more populous towns. I will refer to the epidemic of 1872, in India, which was a severe one, and examine the death-rates from cholera in different towns, all of which were within the infected area, but not all upon lines of railway. In that year the railway system did not extend beyond Lahore, but the epidemic extended from Benares to Peshawar. In Delhi the cholera death-rate of the civil population was 0·36 per 1,000, while in the neighbouring town of Karnal, which was not then on a line of railway, it was 1·78 per 1,000; in Umballa, on the line, it was 1·11; while in Sirsa, off the line, it was 0·47; in Jullunder it was 0·52, and in Ferozepore, off the line, it was 0·60. The heaviest mortality from cholera was at Kohat, distant 250 miles from the nearest railway station.

A comparison of the direction taken by the epidemic in 1872 with that in 1867, 1862, and 1857, shows that the introduction of railways had no effect upon it. Although he was not writing with any reference to this point, and perhaps on that account the remark has all the more weight, the late Dr. Bryden, in his review of the epidemic of 1872, says: "to write the history of 1872 will be to rewrite the history of each of the "years 1867, 1862, and 1857," thus implying that the extension of railway communication in the Punjab between 1867 and 1872 did nothing to modify the progress and course of the epidemic.

Further confirmation of this statement is to be found in a comparison of the epidemics of 1867 and 1879 in the Punjab. In both years the epidemic appeared at Delhi about the 15th April; also its date of appearance at Umballa was the same in both years, although in 1867 there was no railway communication between Delhi and Umballa. At Lahore, too, the date of appearance of the epidemic was almost identical in both years, being a few days earlier in 1867, before the railway was open. Finally, in both years cholera made its first appearance in Peshawar at the end of April. I have prepared a chart which indicates the dates on which first cases of cholera occurred at various places in the Punjab in epidemic years, beginning with 1861. The authorities for the dates are noted at the foot of the chart.

Railways do, no doubt, frequently carry cases of cholera to a considerable distance, but I have searched in vain for any evidence to show that cholera cases thus trans-

ported give rise to localised epidemics, which would not otherwise have occurred in the places to which these cases were conveyed. If railways are a means of disseminating cholera, why are they not constantly carrying it from those endemic centres in which it is always present?

Before beginning this inquiry, I was inclined to think that railways must promote the epidemic spread of cholera; but after reading the histories of epidemic cholera as it occurs in India, and also in other countries, I have arrived at the following conclusions:—

(1.) Railways convey patients suffering from cholera to places which they would not have reached in the days before railways were opened, but such cases do not by themselves determine, or even appreciably influence, the course of the epidemic.

(2.) Railways are a great safeguard to those who use them in order to escape from an infected locality; and as they constitute the quickest means of dispersing a large collection of people from any place in which cholera has appeared, their influence, so far as these people are concerned, is eminently salutary, and the consequent introduction of some cases of cholera to previously non-infected places is dangerous only in so far as the sanitation of these may be defective. Seeing that pilgrims return to hundreds of thousands of villages and towns without their return being followed by outbreaks of cholera in more than hundreds of them, it is reasonable to presume that the outbreaks in the latter are due to some causes peculiar to them and not common to the thousands that escape; in other words, that the "fault," whether it be defective sanitation or something else, is not proper to the pilgrims. This statement is based not only upon the records of Indian experience, but also upon those of the European epidemics of 1884 and 1885. In a supplement to the 15th Annual Report of the Local Government Board, page 107, the following passages occur: "The experience of cholera in England "justifies a belief that the presence of imported cases of the disease at various "spots in the country will not be capable of causing much injury to the "population, if the places receiving infection have had the advantage of "proper sanitary administration." Again, "cholera in England shows itself "so little contagious, that, if reasonable care be taken where it is present, "there is almost no risk that it will spread to persons who nurse and other-"wise closely attend upon the sick." One more extract from the same report: "Thus, when a case of cholera is imported into any place, the disease "is not likely to spread unless in proportion as it finds, locally open to it, "certain facilities for spreading by indirect infection." These and other references in this paper to European and American experience are not, I venture to think, irrelevant, because they show that those who have had especially favourable opportunities for observing cholera there, have arrived at conclusions which agree with our experience of the disease in India.

Again, in order to ascertain whether cholera epidemics are of more frequent occurrence in the Punjab since facilities for railway travelling have been increased, I have had tables prepared for the chief stations in that province both for those on the line and those distant from the line of railway, showing the cholera mortality for each year, from 1868 to 1892 inclusive. The statistics for troops, European and Native, for prisoners, and for the civil population, are given separately. The tables are bulky, and it is not considered necessary to reproduce them, as the statistics contained in them have already appeared in printed sanitary reports. Nor can much importance be attached to evidence of this sort, because in the last 16 or 20 years many changes, besides the extension of railways, have taken place; chief of all, from the present point of view, has been the progress of sanitation. However, these tables, at any rate, establish the fact that cholera is not of more frequent occurrence than in the years before railways were opened.

If railways were a means of disseminating cholera, they would obviously convey it in every direction indifferently. But, in the Bengal Presidency, "the direction of an "epidemic is always upwards," *i.e.*, towards the North-West Frontier. "Such a thing "as an epidemic moving downwards is absolutely unknown" (Cholera: by Surgeon-General Cuningham, page 21). This fact alone would suffice to show that the influence of railways upon the distribution of cholera is inappreciable.

ABSTRACT OF REPORT OF THE ACTING SANITARY COMMISSIONER FOR MADRAS FOR 1893.

(Surgeon Lieutenant-Colonel W. G. King.)

General Population.

Vital Statistics.

Births.—Registration returns were received in this office for a population of 33,693,179 according to the census, and amounting to 34,878,308 according to the estimated population. Unless otherwise stated, the calculations referred to in the following paragraphs are made upon the census figures for the population thus represented. Where it has been thought desirable to aid accurary as to ratios, the "estimated population" has been employed, and this is specifically mentioned in each instance. The fact that during the decade of 1881–1891 (beyond the distress localized in Ganjám) the conditions affecting the vitality of the people were of a fairly normal character, enables this method to be employed with fair safety. The rate of increase found at the census, however (15·58 per 1,000 per annum), is, as pointed out by the Superintendent, greater than is likely to be continued, on account of the population of the decade including larger numbers than normal at the reproductive age—a result brought about by the heavy mortality in the old and very young during the famine period of 1876–78. But, although this fault is obvious as regards the total population, and in certain localities further difficulties are encountered as an effect of known rapid decrease of town populations due to depressed commercial conditions, or abnormal increase owing to the opposite state of affairs, the use of the "estimated population" cannot but be an aid to affording clearer ideas as to the true interpretation of these statistics, albeit that complete accuracy cannot be ensured. The annexed table shows the birth and death rates of the Presidency since 1881, according to the estimated population of each year:—

Year.	Birth-rate.	Death-rate.	Year.	Birth-rate.	Death-rate.
1881	24·4	15·8	1888	25·7	18·4
1882	24·9	15·8	1889	26·3	20·1
1883	25·6	17·9	1890	26·8	19·5
1884	26·4	21·2	1891	27·3	22·0
1885	25·9	19·8	1892	24·6	21·8
1886	26·5	17·6	1893	26·1	18·7
1887	26·5	18·9			

The natural increase of the total population, according to the obviously defective registration in force, amounts to 528,849 since last census, against an estimate of 1,404,098. The mean birth-rate during 1893 for all districts, excluding municipal towns, was 26·5, and for municipal towns 34·1 per 1,000.

The rural towns and not the villages—the former being reckoned at over 10,000 inhabitants—are the greater defaulters in registration of births, the rate for these being 24·8 per 1,000 against 26·5 per 1,000 for villages. The reason of this I believe to be that in these towns, which represent the connecting link between the rural and urban areas properly so-called, the population is so large as to be absolutely unsuitable for the carrying out of the system of registration by village karnams. In towns of this size, large numbers of families not immediately connected with agriculture live. Upon these the village headman and karnam have no influence, and hence, irrespective of the difficulty connected with the large area of the town, the karnam is much less apt to secure correct results. If, again, the admittedly defective results of Vizagapatam, Ganjám, Madura and Nellore be omitted, the average birth-rate for districts becomes 32·4 per 1,000. Evidently, some method of reform as to registration within these areas should no longer be neglected.

Nothing is more unsatisfactory in attempting to obtain results from the vital statistics available in this country than the knowledge that both the birth and death rates are sliding scales, according as the results ascertained by one authority or another be relied upon. The opinion given by Mr. G. Stokes, as Census Superintendent of 1881, was that the birth-rate amounted to 42·45 per 1,000. Again, Mr. Hardy, taking the results for certain districts, stated that it was about 53 per 1,000 Mr. Stuart, the Superintendent of the Census of 1891, considers that the birth-rate should certainly not be less than 50. To those accustomed to regard figures ranging but little above 30 per 1,000 as representing registration that has been carefully supervised in villages, this figure seems appalling; but it is undoubtedly reached and exceeded in certain tracts of Bengal and Bombay, chiefly in localities, however, where infantile mortality is abnormal, owing to insanitary local conditions, and where, consequently, the physiological factor as to lactation restraining fecundity is not in operation.

The Chingleput district has been long famous for care as to registration, and at the census it was found that the error amounted to only 2,397 in the decade. Of course, this exactitude may have been mere chance, owing to emigration and immigration having turned the balance in the right direction. In any case, the Chingleput results are undoubtedly superior to those of any other district, although they are not absolutely trustworthy; but they evidently give, if the statistics of registration in the census report, page 49, be correct, results that cannot be far below the standard required. Thus, the rate of increase for Chingleput in the intercensal decade was 14·78.

The birth-rate according to this office records was, on the population of 1891, 36·74 and the death-rate 23·4. According to the figures for births and deaths given by the Census Superintendent for the ten years, the mean birth-rate was 36·72 and the death-rate 22·4 per 1,000. Now, if it be allowed that the true birth-rate was 42 and the death rate was 27, the rate of increase is satisfied. It is probable that deaths are more correctly registered than births, as they attract more attention on account of the attendant ceremonies, and, consequently, it is likely that less raising of the death-rate is necessary than a discussion from the fecundity point of view would seem to render requisite, as thus stated by the Census Superintendent:—"In every 1,000 of the "population there are 164 wives of child bearing ages, and Mr. Stoke's birth-rate gives "only 259 births annually to 1,000 wives of reproductive ages, which is considerably "lower than the fertility in England, where the proportion is about 290 per 1,000." But it seems to me quite possible that registered results as a test of increase, as estimated by registration of births and deaths, say, in Chingleput, may require no great correction, whilst the fecundity theory may remain true. The "born-dead" rate remains unsettled, and is more than any form of registration liable to be neglected. Immature motherhood would certainly tend to swell the number, and ineffective medical aid usually available would add to this; further, the much longer lactation pursued by Indian mothers must not be lost sight of. The Superintendent's statistics presumably take cognizance of child-birth at below 20 and above 40 years of age, but if the chief range of from 20 to 40 be recognized, the English rate of birth per 1,000 women is only 190. The child-bearing range of Indian life has still to be ascertained, and, although puberty is earlier than in Europe, it is possible that fecundity wanes quicker. It would be a matter of great advantage were Government to select certain areas where, by the appointment of a special officer to aid local authorities, registration could, for a fixed period, be rigorously conducted and verified by holding a triennial census.

This is a very different way of facing the problem to entering into the elaborate calculation of a "life table," and must, therefore, be taken for what it is worth; my object is, however, not to assert that the rates now mentioned are correct or those which should be accepted, but as pointing to the probability that, without further demonstration, for standard purposes, the birth-rate of 42·45 adopted by Mr. Stokes might be safely aimed at in most parts of the Presidency by officers whose duty it is to criticize birth and death registers, in lieu of Mr. Stuart's higher rate of 52.

A total of 909,153 births were registered during the year throughout the Presidency. The proportion of male to female births per cent. was 104·3 in districts, and 105·6 in towns. Reckoned upon the population of 1891, the birth-rate for Hindus was 27·3, Mahomedans 24·3, and Christians 22·5 per 1,000, respectively.

In districts where there are large zemindary tracts, the birth-rate returned is absurd, owing to imperfect registration and the results being reckoned upon the total population.

In this category, may be classed Ganjám (18·1), Vizagapatam (21·6), Nellore (22·4), and Gódávari (23·0). The highest rate registered for districts was 35·6 per 1,000 in Chingleput. Three districts returned over 30 per 1,000, 16 over 20 per 1,000, and the rest rates less than this. In municipalities, Cuddapah returns the remarkably small birth-rate of 16·1 per 1,000. This result is probably due to the long recognised influence of continued exposure to malaria in diminishing fecundity, the total death-rate in this town being 47·3, and that from malarial fever 32·2. That this small birth-rate is due to this condition is further illustrated by the fact that, notwithstanding this town gives the highest rate (297·5 per 1,000 of registered births) of infantile mortality in the Presidency, the usual factor of early cessation of lactation has obviously failed to raise the birth-rate. In contrast, I may say that in Madras, the next most unhealthy town as to infant-life (294 per 1,000 of registered births), the birth-rate was 40·5 per 1,000; but here malaria is not the predominating cause of mortality. Twenty-one towns gave rates above 35; 19 above 30; 13 above 25; and three gave rates below this amount. The difference of results between municipalities and districts, it need hardly be observed, is due chiefly to more efficient registration in the former.

Deaths.—A total of 585,095 deaths was registered in districts, and 64,687 in municipalities. This gives a death-rate of 19·3 per 1,000 on the census population, and 18·7 per 1,000 on the estimated population from which returns were received. The rate is below the decennial average by 2·7 per 1,000, and is less than in the previous year a fact that may be accounted for to some extent by the less than average infantile mortality of 1891, 1892, and 1893. The death-rate per 1,000 of the census population of Hindus was 19·4, of Muhammadans 18·0, and Christians 15·5.

In comparison with the previous year, there was a decrease of 3·0 per 1,000 under the following heads:—Cholera (1·3), small-pox (0·5), fevers (0·6), dysentery and diarrhœa (0·3) and "other causes" (0·2).

The healthiest month of the year was June; the more unhealthy November and December. This may be ascribed to fluctuations of the sub-soil water, disturbance of sub-soil air, damp ground and dwellings, and exposure of agriculturists during labour incident to field work, in a season the majority of which is attended with rain. Although these results represent the average for the Presidency, it does not represent the truth for certain localities. For example, in the city of Madras, as judged by the decennial mean, whether it be as to cholera, diarrhœa and dysentery, or fevers, the months of the greatest mortality are August and September, a result, I believe, to be due to the relation of the specific poisons of these diseases with the fluctuation of the underground water, in an unusually filthy subsoil.

The marked increase of the rate of deaths in females as compared to males at the age of from 15 to 30 results, presumably, from this being the most dangerous period to the young native mother. From what I have seen of native midwifery, it is pretty well a foregone conclusion that none but the "fittest" survive the extraordinary, and in many cases, ignorant treatment to which they are subjected. Hence the range of mortality during the child-bearing age is probably confined within a smaller period of life, and is greater at this than at any single period of female life in Great Britain. The slight rise of mortality in female life in that country at the age of 15 is connected with increased risks at puberty, and cannot be ascribed to child-bearing to any marked extent.

The deaths of 142,368 children below one year of age were registered, being a mortality of 156·6 per 1,000 of births during the year, and 122·2 per 1,000 of the infant population. The deaths of male infants were in the proportion of 115·6 to 100 of females. As to the cause of the heavy mortality, it undoubtedly results chiefly from ignorance of mothers in respect to simple hygienic facts. As to the remedy for this state of affairs, it is unlikely that improvement can be looked for until the Educational Department more fully appreciates the importance in this and other social matters, by bestowing more effort upon the education of women. The Hindu "mother-in-law" is omnipotent in the household, and it is under her directions that the new-born infant is seared with a redhot needle, is practically starved for the first three days, and is plied with castor oil taken direct from the lamp reservoir, and, when it has proved its right to survive, is sent naked in sun or rain.

The enormous mortality of infants below one year of age is a feature of great importance in the Presidency, and affords a most marked contrast with the English

rate at the same age. The following figures, deduced from the statistics for the census year (1891) of 23 municipalities not markedly unhealthy, show that the early deaths of infants below one year of age must have much influence on the birth-rate:—

——	Under one year of age.	1–5.	5–10.	10–15.	15–20.	20–30.	30–40.	40–50.	50–60.	60 and over.	Total.
Death rates in 23 Municipalities.	176·25	32·17	9·92	9·20	14·16	17·80	18·96	23·96	37·54	83·68	28·64
Death-rate in Madras town.	375·80	72·95	16·97	11·94	13·01	17·09	18·66	22·96	34·79	117·66	40·47

The above table not only serves to illustrate the condition alluded to, but also to exhibit the comparative death-rate, according to ages, in mofussil municipalities and the town of Madras respectively.

In making his life table for Madras, Mr. G. H. Stuart made a correction to cover inaccuracies of statements received as to age during the census. A similar correction not being available for the statistics of the rest of the Presidency, I have thought it better to take age constitution as stated in the census returns both for mofussil municipalities and for Madras town. The following table shows that Madras possesses an advantage as regards age constitution as affecting mortality, when compared with average municipal towns. The larger proportion of persons at the "useful ages" (60·23 against 50·60 of the mofussil) and less proportion of infants, ought to enable Madras to show a more favourable state of health than these. The local conditions are, however, so bad, that the mortality of infants is much heavier than elsewhere, being 375·80 per 1,000 of the population below one year of age, against 176·25 of 23 mofussil municipalities. Indeed, if Madras town were placed under similar conditions of population with mofussil municipalities, there would be greater mortality than already exists, which is bad enough. This table illustrates this fact, and shows that Madras depends largely for the up-keep of its population upon immigrants for labour at the "useful ages":—

Age period.	Age constitution per 1,000 of population.		Average deaths per year in Madras from 1st January 1888 to 31st December 1892.	The number of deaths that ought to take place in a year in Madras under conditions similar to those of 23 Mofussil Municipalities.
	Madras.	Twenty-three Mofussil Municipalities.		
Under 1 year of age	30	34	5,136	5,821
1–4	91	116	2,992	3,814
5–9	116	133	893	1,024
10–14	97	100	528	539
15–19	87	80	511	556
20–29	193	173	1,493	1,338
30–39	150	140	1,259	1,175
40–49	108	100	1,123	1,040
50–59	66	61	1,045	966
60 and over	62	63	3,337	3,291
Total	1,000	1,000	18,312	19,664
			40·47	43·45
			Recorded death-rate.	Death-rate corrected according to age incidence.

Chief Diseases.

Cholera.

The cold weather exacerbation of the cholera epidemic of 1892 persisted in the first quarter of 1893 in South Canara, Malabar, Vizagapatam, Gódávari and Kistna. In the southern districts, during the same period, the disease did not in any instance exceed one dozen cases per month. By the end of April, the whole Presidency was free with the exception of the districts of Gódávari and Kistna, where, however, only 42 and 41 cases occurred against 251 and 1,227, respectively, in the first month of the year. In June, there were 2 cases in the Tanjore district, 6 in Gódávari and 1 in Ganjám; in all the other districts cholera was now reported absent. In July, there

were 13 cases in Ganjám; previously, 1 in June and none between that month and January had occurred. In August there were 4 cases in the same district. In the south, in Tanjore, again, 2 cases had been recorded; so that, with the exception of February and May, in no month was this district rid of the disease.

On the eve of the north-east monsoon, the tendency for cases to multiply in the districts affected by it became apparent, while the south-west monsoon districts remained comparatively free. The district which took the lead in numbers was North Arcot, where, in September, 73 attacks were registered. By October a firm hold had been acquired in South Arcot, Trichinopoly, Tanjore, Madura, Salem and Coimbatore; by November in these areas a wide-spread epidemic had developed. In November there was a recurrence of the disease in the northern districts—Ganjám, Gódávari and Vizagapatam; but in none of these did the attacks exceed 100.

There is evident here, as has long been known, a connection between cholera prevalence in certain parts of the Presidency and the area affected by the respective monsoons. So far as this epidemic is concerned, it is apparent that, with the burst of the north-east monsoon, there was a rapid tendency to spread in those districts, which the classification I have adopted shows received the greatest share of the total rainfall, and that it was not till later on that the districts less affected by this monsoon were attacked; or, in other words, in the early months of the cold season the southern parts of the Presidency were affected, and in the latter months the northern. In watching the progress of the epidemic by means of daily reports received in this office, there was evident at first an advance from the north towards the south of the Presidency, and later on—with, however, slower comparative progress—there occurred the return march, which day by day pushed forward, secured the final overrunning of the northern districts The immunity which the north midland districts—Anantapur, Cuddapah, Bellary, and Kurnool—exhibited from an advance of the epidemic, although in the case of the two former local outbreaks following importation of the disease occurred, is remarkable. These districts, both in regard to rainfall and geological formation, have similar and peculiar features.

Mode of origin and spread.—Coincident with the appearance of renewed activity of cholera in North Arcot, I issued a circular to district sanitary officers, asking them to watch the progress of the epidemic, and to favour me with the result of their investigations on each outbreak coming to their notice. This action I was enabled to subsequently confirm by G.O., No. 757, Public, dated 12th September 1893, communicating the desire of the Government of India that the progress of epidemics should be carefully watched and reported upon. Under the Standing Orders of the Board of Revenue, outbreaks of cholera must be immediately reported to "the Collector "of the district, to the District Medical Officer and to the Medical subordinate in "charge of the dispensary, if there is one, in the taluk or divisions." There is, however, frequently hesitation to recognise cholera as such, until it has proved that it is not diarrhœa by causing an alarming percentage of deaths. It is frequently only in this event (unless the village Head has a wholesome dread of a collector having more than an average belief in the efficacy of sanitary efforts) that the first report reaches the District Sanitary Officer from out-of-the-way villages. Thus, the reports received have, in some instances, flaws of evidence due to want of full information being supplied; but, on the other hand, several are very distinct, and state facts as to which there can be no doubt. It is hoped that, by continuing this system from year to year, much of the etiology of cholera that is still shrouded in mystery will be solved. The behaviour of cholera in Europe has at no time, since Dr. Snow's famous proof of the disease being waterborne, presented much that is problematical to the medical profession. In Europe, it is now possible, with the aid of telegraphic intercommunication, to trace the course of the disease from country to country, and to identify the medium of spread with fair accuracy. The wide acceptance of Koch's "cholera bacillus" as the *fons et origo of* the disease has also simplified explanations. But in India matters cannot be thus readily disposed of. Theory after theory has been invented only to be placed *hors de combat* by facts that have been gathered by statisticians of this country. The very plethora of facts collected has proved a stumbling-block. Take, for example, the opinion as to the connexion between cholera spread and the pilgrim festivals of India. Investigation will often show that before the movement of the pilgrims commenced there was a tendency for the disease to make its appearance in the neighbourhood that it is contended was affected by their arrival. Confronted with evidence as to seasonal prevalence, it may be pointed out that progress

of pilgrims in one direction was attended with cholera, whilst, in the other, it was not, and the theorist necessarily retires discomfited. Again, if it be suggested that the water of a river has become contaminated, and that cholera has spread thereby, evidence may be brought forward from other epidemics which goes to show that the disease advanced against the stream, against the wind, and so forth. Now, if I may be allowed to place an opinion on record side by side with the many dozen that have been advanced concerning cholera, I would state that the chief factor preventing the medical profession in India coming to a complete agreement, is the attempt by successive authorities to abide by a single explanation to the exclusion of all others; and, secondly, that to minds determined to accept nothing but hard facts, the description of information generally placed at disposal must have rendered the arrival at conclusions almost impossible. This results from the simple circumstance that, up to recent years, communication with the interior parts of the country has been far too slow to enable the observer to watch the progress of epidemics with the accuracy which is possible in Europe. Nothing short of the most complete system of discipline in respect to rapid reporting of cases of cholera by village Heads, and the investigating of individual outbreaks by intelligent and, if possible, professional men, is likely to secure reliable information. In short, when, in conjunction with our District Boards and Municipalities, a Public Health Service is organised, neither in investigating epidemics nor in attempts to combat them would the present state of doubt and dubious remedial measures long continue. Within the last 10 years enormous strides in the development of railways and telegraph systems have been accomplished, and, if the rate of progress continues, there will shortly be no portions of districts with which intercommunication by wire or rail is not readily effected. Under such circumstances, it would be possible to secure a record of cases as they occurred from day to day, and the sanitarian would no longer be driven to making facts and theories fit into each other after the method of a Chinese puzzle; reliable data, and not disjointed fragments of evidence, would be available. Further, it must be remembered that the areas dealt with are large, and differ greatly as to general physical characteristics as to soil, sub-soil, and water-supply, as to population, as to public sanitary precautions practised, and as to customs of the inhabitants.

Mortality from cholera.—Heavy mortality occurred in the districts of Tanjore and Trichinopoly, and this I ascribe to the influence of the floods to which these districts were subjected shortly after the importation of the disease, causing wholesale spread of choleraic excreta that were not correctly dealt with. In Tanjore 1,194 villages of a total of 3,550 were attacked, and in Trichinopoly, of a total of 1,502 villages, 468 were affected. The rural population suffered to the extent of 4·7 per 1,000 in Tanjore, and 4·0 per 1,000 in Trichinopoly. Of the urban areas, the Municipality of Trichinopoly lost the greatest number of inhabitants, namely, 13·6 per 1,000. An account of the conditions found in this town has been already given in the preceding paragraph.

In Tanjore town preventive measures were taken by the municipality, but they were of too meagre a nature at first to be effective; the municipality, however, subsequently did its best to control the epidemic, and, in all probability, actual benefit resulted.

In Negapatam, sustained efforts were made to segregate and destroy the choleraic matter from the origin of the epidemic, and although measures for disinfection or destruction of infected clothing fell short of requirements, under circumstances over which the Chairman had no control, the result apparently was that this town escaped in a manner that exhibits a great contrast to its former history and to the large towns of Trichinopoly, Tanjore, and Kumbakónam, all within the Coleroon-Cauvery area. The Chairman has also informed me that, practically, the same efforts had been made in 1902. The result is exhibitted in the following table:—

	Death-rate per 1,000.
Negapatam	1·7
Tanjore	10·2
Kumbakónam	7·2
Mannárgudi	7·3
Trichinopoly	13·6

In Calicut, Bezwada, and Tirupati also measures were promptly taken by the municipalities concerned.

The total number of deaths from small-pox in the Presidency during 1893 amounted to 27,289. In District Board areas, the deaths represented 0·8 per 1,000 upon the estimated population, and in municipal areas 0·5 per 1,000. This would apparently prove the better efficacy of vaccination in municipal areas; but, if the exceptional district of Malabar, where the mortality reached 4·8 per 1,000 be excluded, the advantage lies with the districts, the rate for the latter then being 0·49 per 1,000. The following shows the number of deaths from small-pox in the Malabar district for the last five years:— Small-pox.

	Number of Deaths.		Number of Deaths.
1889	1,267	1892	11,695
1890	391	1893	12,068
1891	6,485		

It is probable that a very large percentage of the deaths from this cause occur amongst Moplahs, whose peculiar dislike to any innovation, under which vaccination would be classed by them, is notorious. Not only does this opposition to vaccination render them more liable to attack, but also their habit of overcrowding in dwellings must tell seriously against them. It is the custom for the married man to dwell with the family of his wife; thus room after room is crowded with additional families. There is reason to believe that every effort is being made by the civil authorities and the Vaccination Department to stamp out the disease in this district, but under the above circumstances the work must be uphill.

The question as to whether there has been a decrease of mortality from small-pox in proportion to the advance of vaccination will be discussed fully by the Inspector of Vaccination in his Report for 1893–94, in accordance with G.O., dated 6th July 1893, No. 523, Public, and I have no doubt he will be able to show the great utility the Vaccination Department—albeit an imperfectly developed organisation—has proved to the Presidency. I therefore shall confine myself to certain remarks in regard to the incidence of mortality from small-pox. Dealing with the unsatisfactory statistics at disposal owing to the intervention of the great famine period of 1876–78, I attempted some time back (G.O., dated 12th January 1891, No. 61 L.) to prove that in the decade 1880–89 there was a decrease of mortality from small-pox in this Presidency of 0·43 per 1,000, when compared with 1870–79 the preceding decade. Taking the last 13 years, it is found the rate of mortality in rural areas has been 0·96 per 1,000 of all ages, and 5·29 per 1,000 of children living under one year of age; but for children under 12 years of age the rate was 0·38—a result, to an appreciable extent, produced by immunity acquired by attacks of small-pox in the first year of life, as proved by the heavy infantile death-rate, but, I believe, in chief part to be due to the protective influence of vaccination, which is, under the existing system of option, unfortunately practised late. The difference in favour of less mortality on the total population from small-pox in the latter 6½ years of the period is 0·06 per 1,000. In municipalities the small-pox mortality during the 13 years was 0·35 per 1,000, but between the first and latter 6½ years there is a decrease of 0·71 per 1,000. Thus, the difference in the two periods shows that in the last 6½ years 14,047 lives have been saved, if the figures for District Boards and municipalities be combined.

The heavy mortality of infants below one year of age in the case of rural areas (municipality figures are not available) is significant of the failure to reach infants of populations not subject to compulsory vaccination. Proposals to introduce compulsory vaccination in rural areas have been placed before Government from time to time, but consent has been deferred, until it should be possible not to render prosecutions a double hardship by demanding that the villager should take a long journey to appear before a magistrate, when refusing compliance. Since this date, however, matters have advanced, and rural areas have now the advantage of possessing stationary magistrates within reasonable distances of most villages, and, where this is not the case, it ought not to be difficult to secure the services of honorary magistrates for this purpose. I have consulted officers of the Civil Service, who have themselves given special attention to the subject of vaccination in districts, and have the ripe experience which seniority affords, and find that it is considered by them feasible to enforce compulsory vaccination in major unions. Compulsory vaccination has been accepted by the 56 municipalities representing an united population of 2,100,967; the addition of major unions would add a valuable increment to this population. I trust, therefore, this matter may again be considered by Government.

I have done my best to secure the attention of district boards and municipalities by special circular letters, &c., to the importance of effecting re-vaccination. Small-pox, so far, is regarded quite as an infantile complaint in this Presidency, for the simple reason that infection in the young is not only one of the consequences of living in a but partially-protected population (permitting of vaccination generally at a considerably later period than the first few months of life), but also because infection is encouraged by mothers. If a person fall sick of small-pox, on every alternate day after the seventh of the disease, in the presence of the patient, distribution of food accompanied by certain ceremonies takes place, in praise of the goddess Mariatha, who is supposed to have honoured the household by entering the human body. To this ceremony all the neighbours never forget to take their children. Thus, infection spreads far and wide. The adult population, from being largely formed of persons who have undergone small-pox in childhood, are protected to a considerable extent, but it stands to reason that as vaccination advances, the adult (and most valuable part of the population as it includes the "producers") will, in the absence of the advance of re-vaccination, be subjected to small-pox in a greater proportion than now. The impression conveyed by this adult mortality, which is inevitable, if re-vaccination be not encouraged by every possible means, will be most unfavourable upon the mind of the masses, and will ultimately prove as great a stumbling-block in the progress of vaccination, as it has been in Great Britain—in consequence of the less complete concurrence of medical opinion in former years than now obtains as to the absolute necessity for confirming the protective influence of vaccination of infancy, by a further operation at about the tenth year of age. As a step towards encouraging re-vaccination, I have urged upon Government the desirability of directing that certificates for physical fitness for entering into Government service should be so modified as to show that the candidate has been either recently vaccinated or re-vaccinated. The fear that increased attention to adult vaccination may adversely influence infantile vaccination need not, I think, be considered. Far from discouraging it, I believe, the increased faith that would be obtained by the better preservation of adult life and the submission of adults to the operation, would render the heads of families more alive to the necessity of their little ones being vaccinated. At any rate, although re-vaccinations have in this Presidency increased during the past year, this has also been attended by an advance in primary vaccinations.

In advising Government as to this question, I have especially felt impressed with the large proportion of successful results that can be obtained upon persons who have undergone attacks of small-pox in infancy. Thus in vaccinating the sepoys of the garrison of Bangalore in 1891, I obtained the following figures:—

Particulars.	Perfect Vesicles.	Percentage.	Modified Vesicles.	Percentage.	Papules.	Percentage.	Total Successful.	Percentage of Success.
56 adults - -	5	8·9	18	32·1	19	33·9	42	75
2 children -	1	50	1	50	—	—	2	100

Again, in 1892, I had the opportunity of examining 335 prisoners from the Hill Tracts of Vizagapatam, also Chins, Burmese, and Chinese, who were vaccinated, although they had been subjected to the operation of direct inoculation of small-pox virus in infancy. Each man was questioned as to naturally acquired small-pox after inoculation, and the results of vaccination were noted. Statistics were also collected from medical subordinates, and the figures seem to me to prove that not only is the protective influence of vaccine disease of infancy liable to become weaker as life advances, as shown by English statistics—notably Dr. Barry's in connexion with the Sheffield epidemic of 1887–88—but that this also is true of small-pox whether it be inoculated or be acquired naturally, and that, consequently, it is not only desirable that the operation of vaccination should be undergone afresh by those who have been subjected to it in infancy, but also by those who imagine they have secured a greater grade of protection by having undergone an attack of natural small-pox.

The question of re-organisation of the Vaccination Department is still unsettled, and owing to the financial pressure to which Government is at present subjected, there is apparently no hope of action being taken in the current year. In my opinion, the chief features of any scheme must be the provision of a Central Vaccine Supply

Institute in a cool climate, whence lymph preserved by any suitable process could be issued by the various District Boards and municipalities—this preserved lymph being utilised locally for the starting of fresh lymph by the innoculation of calves where the number of subjects that could be gathered together would warrant the expenditure, or, failing this, could be employed direct on the human being. This arrangement would prevent the necessity of continuous cultivation of the "stock" in various centres differing in climate, and the character of skill available. Experience in this and all other countries where animal vaccine is exclusively used—as is the case in this Presidency—goes to prove fully that the cultivation of vaccine in a manner that shall preserve its original vigour and typical character during transmission from calf to calf, cannot be effected satisfactorily otherwise than in the hands of men with special education and experience. Under existing arrangements, degeneration and ultimate complete abortion of the stock is a matter of constant occurrence in districts and municipalities, where the transmission in bovines is attempted by the present class of vaccinators under the trying circumstances of tropical heat, and very indifferent accommodation for the animals. I need not dilate on possible results as to protection to be secured under such a defective system.

Fevers.

During the year under review, 258,415 persons perished of fever in this Presidency, making a total of 39·8 per cent. of deaths from all causes. The term "fever" covers a multitude of complaints in the estimation of those responsible for registration, both in rural and urban areas. Pneumonia (which is a common affection in malarial localities) passes under this designation, as well as phthisis, which is also a prevalent disease—more especially in town populations—and even dysentery, if the febrile condition be a permanent symptom, may be registered under this head. Nevertheless, the majority of the so-called fevers are of malarial origin. This being so, it is not surprising that results differ greatly according to locality.

The Ceded Districts took the lead in fever mortality, Cuddapah showing 19·7, Bellary 10·6, and Kurnool 18·6 per 1,000 respectively; whereas, in the southern districts of Tanjore and Trichinopoly the death-rate from this cause was but 1·8 and 3·7 per 1,000 respectively.

With regard to towns, Cuddapah led with a mortality of 32·2 per 1,000, followed by Kurnool with 17·5 per 1,000, and Madras with 15·0 per 1,000.

Broadly, the singularly localized character of malaria is shown by the figures quoted; a result evidently dependent upon varying conditions of the soil of the areas concerned. In the district of Tanjore many hundreds of square miles are under irrigation, with the result of its affording the lowest death-rate from fever of districts in the whole Presidency, namely, 2·2 per 1,000. Here the soil is highly pervious for great depths, and surplus moisture is readily removed; but in many parts of the Ceded Districts the opposite is the case; the soil is at times but a superficial layer above limestone rock, that is pervious only at points of fissure. Here the introduction of water to an extent to place natural sub-soil drainage under difficulties, soon results in exacerbation of malaria in the neighbourhood. The difference of behaviour appears simply to result from the well-known fact that in certain soils malarial parasites are not present, or, if it be asserted that complete identification of these has not been secured, it is enough to state that certain soils do not contain this malarial virus, and that no amount of meteorological variations, decaying vegetable or other organic matter, marshes, or what not, can, in such instances, create it *ab novo;* whereas, in others it is in evidence, and requires but certain modifications of heat, moisture, and organic matter present to excite it to active progagation. Of these, the chief factor is moisture, as determined by rainfall and sub-soil water fluctuation. In my opinion, the influence of sub-soil water need by no means be confined to either a fall or rise of its level; each locality must be a study of itself in this matter. Granted that the sub-soil water be generally at a high level, depression below the normal line may be followed by increase of fever; similarly, where malaria has been for years but slightly exhibited, exacerbation may result from the sudden rise of the sub-soil water, and subsequent depression towards its normal limits. Thus, I have known areas slightly malarial, but where life was tolerable, suddenly rendered unfit for habitation either, temporarily, by unusual rainfall, or, permanently, by introduction of irrigation. As regards the sinking of sub-soil water increasing the fever rate, this is brought about by exposure to air influence on layers of soil formerly kept in a state of quietude by saturation; of this, Madras is a good example. With each considerable variation of normal rainfall an appreciable effect has been exhibited upon the fever rate, and in the

years 1890, 1891, 1892, and 1893, the scanty rainfall, *pari passu* with the fall of the sub-soil water, thus induced (which, however, I grant, on account of the peculiar conditions of the site of Madras in respect to sea pressure, has not been great) the fever rate has increased. The change thus brought about in these years has run the fever mortality from 9·35 per 1,000 of population in 1889 to 14·83, 15·01, and 14·29 per 1,000 respectively in 1891, 1892, and 1893, thus making the chief town of the Presidency approach the highly malarious Ceded Districts in unhealthiness.

Attention in this Presidency is very slowly awaking to the importance of careful surface and subsoil drainage in malarious localities; but, as the latter process ought always to prove ready of adoption owing to labour and materials requisite being cheap, it may be hoped that public bodies will not fail to see its importance in the near future.

In a country so greatly depending upon agriculture, interference with methods of irrigation must be undertaken judiciously; but there can be no doubt that much good might be done in opening future irrigation projects, by ruling that not only shall it be shown how water is to be taken on to fields for cultivation, but also how the surplus can be removed, without excessive and useless soakage occurring in the neighbourhood. Mr. Robertson, late Principal of the Agricultural College, Saidapet, has shown that the ryot of this Presidency uses an extravagant amount of water, and that any system that would check its reckless waste would therefore conduce to both financial and sanitary benefit. Public opinion in this Presidency has been much misled by its being a commonly-observed fact that certain of the highly irrigated tracts of the southern districts are free from malaria, and persons who do not trouble themselves as to the existence or non-existence of a malarial parasite as the vital distinguishing difference between the soils of two localities, are apt to deride the possibility of a connection between a high death-rate from fever and carelessly conducted irrigation. The tendency for cultivation under irrigation to be pushed to such an extent as to leave no intervening space between the houses and the fields, to which I have alluded, should certainly be curbed by law, for reasons that are obvious, irrespective of whether a site be malarious or not.

Dysentery and diarrhœa.

A total of 23,814 deaths from dysentery and diarrhœa occurred during 1893. This gives a ratio of 3·7 per cent. to total deaths, and 0·7 per 1,000 of the estimated population of the Presidency, representing a decline of 0·3 and 0·2 per 1,000 when compared with the years 1891 and 1892 respectively. The average for the five years previous to 1891 was 4·5 per cent. of total deaths, and 0·8 per 1,000 of the population to deaths from these special causes. The Famine Commissioner has shown in his Report that in 1891–92 in no district did he find the physical condition of the people had seriously declined, relief works being opened and other measures being consistently concerted directly it was ascertained that food was sold at a rate when a certain section of the community would inevitably suffer. Probably, therefore, the increase under these heads in the period referred to may be safely attributed, in the main, to greater impurity of the scanty water-supply, and to variation of ventilation of the soil, induced by depression of sub-soil water in inhabited areas contaminated with organic filth, and not to any great extent to the use of unsuitable articles of diet. The continued operation of the former conditions is well exhibited in the Madras district, where the death-rate from this cause is the highest in the Presidency, being 14·5 per cent. of total deaths and 5·7 per 1,000 of the estimated population. The influence of a contaminated soil as an important factor and the probable presence of a specific microbe in such cases, have been completely established by Dr. Ballard's *Report on Diarrhœa* at Leicester (1887–88). In regard to the operation of the combined conditions of both impure water and filthy sub-soil, I would further point to the statement of abstract from reports on the sanitary condition of municipalities, para. 1; with information derived from this source, the heavy death-rate from diarrhœa in the undermentioned municipal towns becomes readily explainable:—

Madras	6·0	Tinnevelly	5·3
Conjeeveram	4·3	Tanjore	7·9
Cannanore	6·1	Mannárgudi	4·4
Coonoor	5·9	Kumbakónam	4·2
Tirupati	5·6	Máyavaram	4·1
Karúr	6·0	Calicut	4·1
Tuticorin	6·0		

This action of foul soil in inducing mortality under these heads is also demonstrated by the fact that whilst the total municipal areas give 11·9 per cent. of total deaths as due to diarrhœa and dysentery, the proportion is but 2·8 per cent. in rural areas showing that, under existing faulty conservancy arrangements, the more thickly inhabited areas suffer most.

Injuries.

There is probably no other entry in the registers that gives the average village karnam more trouble than that of "injuries." To determine whether a case be due to "accident" or "suicide" is apparently a difficult distinction in rural life. Thus, I have frequently found cases registered as "suicide," where there was no ground to believe that this was the real cause of death. If no one else can be blamed for causing a death, then the karnam frequently understands that this means that the person killed himself; for example, if a man fell into a well and it was not shown that any one pushed him in, this becomes a case of suicide; or, if a cart ran over him and this result was clearly due to the deceased's own carelessness, the death becomes a case of "suicide." I have also found the entry under killed by "wild beasts," as the result of goring by domesticated buffaloes or cattle. Examination of registers and verbal explanations given by district sanitary officers, and others, will, however, soon see this state of things put an end to, and then, I fancy, there will occur a marked decline in "suicides" that need not be regarded as the result of any change of sentiment or condition of prosperity of the people. An analysis of the different methods of suicides cannot be given from the statistics supplied to this office; but it may, I think, be assumed that the favourite mode of committing suicide by women—who are in the proportion of 1·4 to 1 of males in this respect—is by drowning in wells, whilst men have a preference for hanging and throat-cutting, the use of fire-arms being rare. The total deaths registered under injuries aggregated 10,709 or 0·3 per 1,000 of population.

All other causes.

Registration under the head of all other causes must necessarily include the various causes of mortality not included under the simple classification now adopted for the registration forms. In malarial districts, especially, fatal cases of dropsy following cirrhosis of the liver, which is common in these areas, gangrene following unskilful treatment of fractures by potters, deaths in child-bed, beri-beri, leprosy, diseases of the nervous system, &c., are thus returned. In certain parts of the country syphilitic affections are sufficiently rife to be regarded as a factor of importance in the public health. The total number of deaths registered under "all other causes" in municipalities in the whole Presidency amounted to 14·8 per 1,000 of the estimated population, and 49·4 per cent. of total deaths. In districts, under this heading, 45·4 per cent. of total deaths was registered, the ratio per 1,000 of the population being 8·1.

Sanitary Works.

Municipalities.

District municipalities are administered under Act IV. of 1884. The municipality of the city of Madras has the advantage of possessing an Act (I. of 1884, as amended by Acts VII., of 1884, and II., of 1892), which permits of greater scope as to sanitation than that just mentioned. A proportion of the members of the Councils, or of the Commission, as it is styled, in the Madras municipality, is in most cases elected by the inhabitants. With few exceptions councils elect their own chairmen, Government only exercising the right of making appointments where such action is called for in the public interest.

Proposals which involve the annual budgets are commented upon by this office, when they are presented to Government for sanction by the municipalities; but, with reference to obtaining knowledge of the manner in which sanitary works are executed, difficulty exists. The effect of the rules under which the Sanitary Board of Madras has been worked has been such as to enable the Sanitary Engineer to proceed direct to Government with costly proposals as to the water supply and drainage of towns, without consulting his senior colleague on the Board. These schemes have thereupon been sanctioned by Government, without an opportunity being given to the Sanitary Commissioner to express his opinion, and the consequence is that the only manner in which it has been possible to acquire information as to what sanitary measures are contemplated by Government, has been to obtain information from chairmen of councils, who themselves are not provided with information sufficient to enable the sanitary advantages aimed at to be correctly gauged. In connection with the remark of the Army Sanitary Commission to the effect that, notwithstanding they are described in the section of this report written by the Sanitary Engineer, comprehensive sanitary

schemes for drainage and water-supply should be discussed by me, I have recently placed the subject before the Government of Madras for consideration, and trust that some modification of existing rules enabling me to keep touch with the sanitary condition of municipalities and proposals for their improvements may be effected. I, however, append, as required, a statement of the conditions of "major works," ascertained by inspection during the three months I held charge.

Major Sanitary Works.—I inspected the Tanjore and Trichinopoly waterworks, the Kandal sewerage works, the Ootacamund intercepting sewer, the Kumbakonam drainage works, the Madras Town sewage works, and the Government House, Guindy, water-supply. The Deputy Sanitary Commissioner, Surgeon-Captain Bannerman, also inspected the Cuddapah waterworks, and investigated a scheme proposed by Mr. Allen for Salem. The waterworks in Tanjore and Trichinopoly were in process of accomplishment. In both cases, it is apparently the intention of the Sanitary Engineer to pump direct to the town from the neighbouring river, using the sub-stream in the sandy bed as the source of supply. As in neither case were the works in the river beds sufficiently advanced to tap the stratum from which water is to be derived, I am not in a position to state the quality or quantity of water likely to be secured, this office not being provided with papers on the subject.

Surgeon-Major Browning, surgeon to his Excellency the Governor, having called attention to the very evil condition of the catchment area of the Marlimund water-supply and the impure condition of the water as proved by analysis, I took an early opportunity of inspecting the Marlimund and Dodabetta reservoirs at Ootacamund. I found the catchment areas in both cases were open to contamination by surface drainage from cultivated tea estates inhabited by coolies, and that such amount of the water as is derived from springs is brought to the reservoirs after running in channels receiving flow from forest lands usually loaded many inches thick with leaves and other matter, and that, in the case of the Marlimund supply, these conditions were added to by the immediate surroundings of the reservoir, consisting in part of peat bog and the bed being, in a portion, of the same nature. A part of the surrounding peat bog had fallen into the reservoir in 1884, and floating masses of peat have up to date frequently to be removed from it. Under these circumstances, after obtaining very full analyses by the chemical examiner of the layers of water at various depths in the reservoir, and of the supplying springs at different points, which fully confirmed my opinion as to the site at which the contamination was chiefly acquired, I was not prepared to advise trusting to catch-pits, a provision which neglected the condition of the peaty subsoil, and filtration, as advised by the Sanitary Engineer, as it was evident that the nature of the reservoir was such as in itself to contribute the greater part of the contamination—*unless it were proved that the execution of more radical measures were so costly as to be prohibitive.* I therefore, in my inspection notes, suggested the following course:—

(1.) That the Dodabetta reservoir should be retained, but the Marlimund be abandoned. (2.) That for the storage of the latter supply, a reservoir not in a peat bog and nearer the spring heads be selected. (3.) That, in both cases, the forest land and cultivated tea estates be excluded from the catchments. (4.) That the loss of collecting area thus entailed be remedied by an increase of catchment on the grass land zone of Snowdon—beyond the sholahs—as suggested in the original design by Major Morant, R.E., and by a similar extension on the Cragmore Hill, in the case of the Dodabetta water-supply. (5.) That the supplies from the north and south reservoirs (the Marlimund and Dodabetta, respectively) being already united in the distribution system in the town, this compensation would probably suffice. (6.) That the springs in all cases be received, as near as possible to their sources, in pipes, and thus be conducted to the reservoirs.

The drainage works of Kumbakónam are of a most unusual class. The town is between two rivers, that are above the level of the site, which is, however, protected by artificial banks along the river. The bursting of one of these banks, on the occasion of a flood, seems to have given rise to the opinion that protection from storm water was requisite. To meet this view, an unlined excavation of six miles in length, 20 feet broad, and about 10–12 feet deep, has been formed. At present, its sanitary value is very slight. In the immediate vicinity of the trench, there has occurred a fall of subsoil water which is most desirable in this locality, whilst the full advantages to be derived from removal of storm water cannot be estimated till the scheme be further extended. Up to 31st December last, the work had cost Rs. 88,496, of a total estimate of Rs. 1,10,000. In the meantime, the people are drinking water from open tanks subject to gross pollution. Filaria disease is common in this town. This scheme was, I believe, not conceived by the present Sanitary Engineer.

In Madras town no works of importance were effected during the year, although at points the "open drain" system with which it is provided, was extended. The question of Mr. Cousin's schemes for the improvement of the drainage and water-supply of the town has, unfortunately, been subject to consideration at a time when, on account of the "exchange difficulty," the financial position of Government is unsatisfactory. In the meantime, practically the old condition of affairs exists. The "open drain" system of sewerage formed in Black Town at a cost of about 12 lakhs, necessarily receives storm water, and as, during certain parts of the day in No. 1 main sewer—built for this otherwise open system—the ordinary sewage flow cannot be accommodated, or, what is the same thing as to result, cannot be pumped, or is not pumped out sufficiently rapidly at the outfall well, overflow of diluted sewage during rainfall on to the streets occurs. In cleansing this "open drain" system, much sludge with rubbish is placed at the sides of the roads, and, in the process of dessication or soakage, is causative of contamination of the air and soil. The sewage conveyed is composed of sullage water, and the flushings of private latrines, which are supposed to be worked on the separate removal system. But no separate receptacles are, as a rule, provided; fœcal matter is received on the flooring of the latrines. Excreta are often seen protuding from the house end of the drains. Moreover, the people use the open drains for purposes of nature considerably. The difficulty with the main sewer No. 1 does not occur solely during rainfall, it daily relieves itself of surplus sewage by overflows, at the period of maximum flow, into the old "main drain" of the town, which is an ancient, pervious, brick and mortar, structure of very flat gradient. I lately had the opportunity of inspecting this main drain. Excavations made at the side showed that there was saturation of the surroundings with a black fœted greasy fluid, and the points in the brick-work could be traced by saturation with the same material. It is within the sub-soil water level of the town, and no doubt, with fluctuations of its level, sewage must ebb and flow in this drain. In Triplicane, a most unhealthy part of the town, the same form of pervious brick sewer still receives all sewage; subsoil soakage is inevitable.

The chief water-supply of the town is received from the Red Hills Tank. The water arrives at the town after flowing through about six miles of a more or less inhabited area. The distribution is on the "constant system," but pressure is insufficient, and at times the pipes at certain parts are empty, irrespective of the whole town supply being turned off for two hours weekly. Flushing pipes dip directly over and into drains, certain mains pass through sewers, pipes to fountains pass beneath permeable gutters, and run close to old underground permeable drains; contamination by aspiration of air or fluids is therefore possible during temporary cessations of flow.

Another source of water-supply—the "Seven Wells"—is that utilised by the British troops. It is derived from the sub-soil flow in a belt of sand within the inhabited area of the town, that no doubt used in former days to yield a fairly pure supply. The wells are, however, within the sub-soil flow of the site of a sewage farm that is not under-drained, the farm itself being made of rubbish deposits that must contain tons of fœcal matter. It is not to be wondered at that the water is now pronounced chemically bad. Typhoid fever has been frequent and coincident with a general fall of the sub-soil water level of the town site, and this source must therefore be regarded with suspicion, although no direct proof of specific contamination has been forthcoming. The conservancy arrangements of the municipality are bad in the extreme, both staff and plant at disposal being far below actual requirements. Many of the old tanks of the town have in former days, and are up to the present time, filled with town rubbish, and, therefore (in the absence of a complete night-soil system) with much excreta. Without entering into further details, it stands to reason that the sub-soil of this town is peculiarly and unusually contaminated with organic matter, and unfit for use as a water collecting area.

The matter of the Cooum has always attracted much public attention from the nuisance caused; but it is, I believe, quite a secondary matter in the sanitation of this town. The Cooum is a nuisance, because it is the recipient of sewage from the town. In the presence of a correct sewerage system preventing this occurring, there would be no necessity to spend huge sums upon this river *per se*, although, doubtless, certain improvements of a minor character would be desirable.

Mr. Cousins' scheme of drainage provided for the cessation of further extension of the "open drain" method, and the employment in lieu of the gravitation (pipe) system. Difficulties as to house connection have been urged as a reason for its rejection, and the trouble experienced in Bombay and Calcutta have been appealed to. But, in Madras, the houses are nearly all one-storied, and are provided with drains

towards the street and open courtyards to the back. Granting certain, by no means insuperable, difficulties exist as to water-closets with a native population in the majority of private houses, there need be none as to public latrines, and the early adaptation of the water carriage system to even this limited extent would be an enormous advantage. A gravitation scheme combined with Mr. Latham's hydraulic automatic pump system of sewerage, would, I believe, meet the requirements of the town infinitely better than the most unsatisfactory mode of open drainage and faulty separate removal of excreta, at present pursued. Mr. Cousins' water scheme has, in the main, received general approval.

I inspected the Government House, Guindy, water-supply. Drinking water is obtained from a well; bathing water from the Adayar. This is a stream formed by the overflow from an irrigated tank, and the collection of drainage from cultivated fields of many miles area. Close to the point where the water is pumped to Government House are nullahs forming the easement ground of the neighbourhood; above this point, the washing of clothing from Madras and the villages in the vicinity is conducted. Under the advice of the Sanitary Engineer, the water has been filtered and distributed throughout Government House for washing and inferior purposes. In my opinion, the risk involved in distributing the water filtered is greater than when by its uninviting colour and evil odour there was little chance of its being substituted for drinking water by careless or ignorant servants. The sinking of another well would probably have more cheaply got rid of the risk of using this dangerous supply inside the house. This opinion is shared by the surgeon to His Excellency the Governor, who had drawn up an independent report on the subject—arriving at the same conclusion—prior to my inspection during his absence.

The following is an extract from a report by the Deputy Sanitary Commissioner on the lately opened waterworks for the town of Cuddapah :—

"*Water-supply.*—Drinking water is wholly derived from the Bugga springs, and it is reported that wells and tanks are not now used. The supply is being generally extended to the suburbs, from some of which the hydrants are rather far removed at present, *e.g.*, Nakash and Alamasupet. I visited the springs and found a new grave within 60 yards of them, in an old ground which was reported to be disused."

Minor Works.—In the mofussil municipalities, beyond the large works under execution above-mentioned, many useful undertakings of a minor nature were completed. These are enumerated in the accompanying tables, and may be classified as follows :—

(*a.*) Sinking, repairing, and cleansing wells, &c.
(*b.*) Construction and repair of drains, public latrines, cinerators, dust-bins, slaughter-houses, markets, &c.
(*c.*) Improvement of village sites, &c.

Standard plans have been issued by the Sanitary Engineer for many of the works mentioned, and, under this system, structures of a better sanitary character than formerly are being gradually brought into use. As regards designs costing below Rs. 200, as this adherence to standard plans is not required, much inferior work in the form of latrines and well-sinking obtainable within this sum is still carried out. To secure supervision in this matter, I believe the correct course would be to organize in districts the homologue of the Sanitary Board by forming District Sanitary Boards composed of the District Sanitary Officer, an Engineer, Presidents of the District Boards, and a member of the local authority, interested in the minor works, to be deputed as a member for the time being. Such a Board would be of utility not only with reference to advising as to the expenditure of sanitary grants by municipalities, but also of all local fund bodies.

General Sanitary Condition of Municipalities.—The total estimated receipts of the towns for 1893–4 were Rs. 27,47,600, against Rs. 25,51,800 for the previous year. Of this amount, Rs. 14,53,446 or 52·8 per cent. was assigned for sanitation, and the actual outlay incurred during the first nine months of the year was Rs. 10,27,144 or 70·7 per cent. In 38 towns, the expenditure during the first nine months of the year did not come up to the prescribed proportion, namely, 75 per cent. of the sanctioned allotment.

In the matter of night-soil and rubbish conservancy, and petty improvements of water-supply, pending the execution of larger schemes, steady advance has been secured. On these points Government is most watchful, and the advice tendered in the Sanitary Commissioner's inspection reports is pressed by Government upon notice for execution, as far as the funds at disposal of the municipalities will admit. In no municipality, however, can the night-soil conservancy and rubbish arrangements be said yet to be perfect. There is more or less observable everywhere absence of sufficient

plant or staff, or both, the less inhabited areas being frequently neglected in favour of the more crowded. Even when latrines have been provided, the municipalities have in some cases difficulty in securing that they shall be used in preference to the sides of tanks and water channels. Much of this, doubtless, results from the patterns of the old latrines still in use being of the most primitive and unsuitable character. No human being can be expected to voluntarily subject himself to the frightful odours of an ill-kept or ill-constructed latrine, when there is an open space at his disposal. In the matter of adapting latrine accommodation to the wants of a people who use water for ablution, there is evidently much room for invention both on the part of the sanitarian and engineer.

Only 11 towns are fairly well supplied with latrines, while in 26 others they are at the rate of only 1 for 1,000 to 2,000 people. The remaining towns are very insufficiently provided, the worst in this respect being Madura, Calicut, Mannárgudi, and Máyavaram. This calculation permits of the best possible inferences being drawn, because no estimate as to seats is available, or, in other words, the size of the latrines has not been calculated.

The branch of conservancy known in this Presidency as "private scavengering" is also systematically encouraged by Government. The result has been year by year an improvement in this respect. For the first time this system was introduced during the year in Vániyambádi and Tiruppattúr. The number of houses thus served in municipalities, however, was small (30,239) in proportion to the total (288,622).

Compared with last year, there was a failing off in the number of privies cleaned in the following towns:—Anákapalle, Bimlipatam, Berhampur, Cannanore, Coimbatore, Ellore, Gudiyáttam, Kumbakónam, Mangalore, Mannárgudi, Negapatam, Tanjore, Tellicherry, Tuticorin, Vizianagram. In 25 towns the progress made was but slight, but the service was considerably extended in Walajapet, Ootacamund, Palni, Palamcottah, Srirangam, Rajahmundry, Vizagapatam, Masulipatam, Guntúr, Conjeeveram, Cuddalore, and Trichinopoly.

In submitting certain suggestions for amendment of Act IV. of 1884, I have advised the adoption of the halicore system so successfully pursued in other Presidencies, whereby, in the event of a municipality finding a general unwillingness to adopt the present private scavengering system, it can be made compulsory. This will, if approved by Government, I believe make the task of securing the conservancy of dwellings much easier of accomplishment than at present.

On one point I have, during my inspections, found a tendency to retrograde movement when compared with the period in which the official element entered more largely into the constitution of municipalities, namely, with respect to cleanliness of private premises; and this, I consider, is due to a different appreciation of the matter by councils, that are subject to election by the people. It is difficult to persuade Native gentlemen composing these councils that the individual citizen has no right to poison the soil or air by collecting and storing manure and rubbish in his compound, although they readily recognise that it is the duty of the municipality to see to the cleanliness of the thoroughfares.

Badly off as many towns are, however, in the matter of conservancy, it is in respect to water supply that the greatest sanitary defect is found. Towns in the irrigated districts which depend upon tanks and channels for their water supply especially are sufferers in this respect, and it is in these localities that cholera usually commits the greatest havoc.

The matter of urging the advantage of sewage farming upon the attention of municipalities has been steadily held in view, but what with various caste prejudices on the subject, and the initial expenditure requisite, advance on this point must be expected to be slow. Madras Town pursues the system profitably, but on very bad sanitary principles; the sites being often within inhabited areas, no arrangement being made for under-drainage and discharge of effluent, and, in certain cases, disposal by soakage in the neighbourhood, or discharge into the Cooum being allowed during intermitting working of the lifting machinery employed. In Tanjore, which is the other good example of profitable sewage farming in the Presidency, the method also requires revision from a sanitary point of view. In Negapatam sewage farming on a small scale was commenced during the year.

In regard to executive officers of the sanitary staffs, municipalities are in a difficult position. The men employed as sanitary inspectors have had no manner of training in hygiene, and, consequently, fail to appreciate gross errors that come repeatedly under their observation. In dealing with epidemics, such men are worse than useless. They fail to take action on important points, and content themselves with, metaphorically

and actually, making a smoke! Thus, in cholera epidemics, it is quite the custom for sanitary inspectors to burn sulphur and tar *outside* houses, and to absolutely ignore the prime points of collection of cholera fæces or infected clothing. Under these circumstances I lately addressed a circular letter to the municipalities, and pointed out to them the advantage that would be derived by their men obtaining some form of training, theoretical and practical, however slight. Thirty-three municipalities, consented to go to the expense of sending selected English-speaking inspectors to Madras for a three months' course of training, defraying the cost of their journeys, and permitting them to draw their full pay. This, I think, is a generous way of meeting matters. Government has been addressed on the subject, and I trust that the small sum of Rs. 1,000—asked to further this scheme—will be placed at my disposal.* If this request be complied with, I hope it will foreshadow a new era in the management of sanitary effort against cholera—if not, also, in the minor sanitary work of municipalities. In respect to combating epidemic diseases, municipalities are much behind date. Although it is a foregone conclusion that yearly a number of victims may be claimed by cholera, no organised system of prevention exists. In our jails, a most minutely worked out method is enforced, directing step by step the course to be taken for the protection of the lives of convicts. But, with municipalities, all is left to local option. It is, of course, essential that the principle of self-government shall not be infringed upon; in this case, however, more than local interests are involved—the public of the Presidency at large are placed at risk by inefficient action in any special locality. Hence, I think it most desirable that efforts should be made to ensure a more uniform plan of action. The necessity for promptitude is rarely appreciated. When, for example, cholera is known to be present 20 miles off, it is recognised that it is unpleasantly near, but expenditure in improving sanitary conditions generally, in guarding water supplies, and in retaining a special staff of observation for house-to-house visitation, would be regarded as little short of mere "faddism." When cholera has actually invaded the town, its slow progress, at first, is regarded as a further reason why money should not be expended. The financial conscience is satisfied with the fact that the disease is confined to a few of the specially insanitary portions of the town, and amounts to but a few cases daily; therefore, it is urged, the ordinary staff of the municipality is quite capable of dealing with matters. Not until death after death announces that the town is in full possession of the enemy, is any real effort at defence made. But, even then, the tendency is to pursue a system which shall exhibit activity at a minimum of expense. Bonfires with tar and sulphur, and lavish use of disinfectants along the streets become the order of the day; hundreds of rupees are thus wasted in "making a smoke"; whilst the collection of choleraic excreta, the disinfection of clothing, and the protection of water supplies are ignored. Not until matters assume alarming proportions is the guidance of district sanitary officers fully followed. I, of course, only speak of the type forced upon notice; there are municipalities which, on the opposite, form admirable exceptions to this rule, who willingly follow the advice of the Sanitary Department, as represented by this office, and by district sanitary officers. Nor do I suggest that this state of affairs is the result of deliberate neglect; what I bring to notice is the procrastination practised by certain municipalities. Charged with the economical disbursement of public funds, they naturally desire to limit expenditure during epidemics to instances of urgency, an urgency that cannot however be readily brought home to them; they would fain hope that matters will right themselves, and save them the responsibility of expenditure. Hence, procrastination too often rules the day. As a first step towards obtaining some organised system, I have recently placed certain proposals before Government, advising it be ruled that when a letter from any member of the Sanitary Department, or the collector of a district, be received by a municipality marked "epidemics—urgent," a meeting of the councillors shall be called within three days of its receipt and that the decision arrived at, with respect to the advice offered, shall be at once forwarded to the Sanitary Commissioner, who will have it in his power to bring any points requiring reconsideration to the notice of Government. When to such an arrangement is added a ruling as to the period at which action is to be expected of municipalities, and, in general terms, the nature of the special staff and measures to be employed under varying circumstances, a vast deal of good may be expected at no increase of present expenditure. Further, in the matter of appointing places for disinfection, the permissive "may" in the clause of the Act dealing with this subject allows too much scope for discretion; in the public interest the word "shall" should be adopted, and this I have accordingly

* This scheme has, since writing the above, received the sanction of Government—W.G.K.

proposed in submitting certain suggestions for amending the sanitary clauses of Act No. IV. of 1884.

There are few municipalities that cannot afford to make definite arrangements for disinfection of some sort. In 1882, as Special Sanitary Officer for the Town of Madras, during an epidemic of cholera, I pressed that requirement upon the notice of the Municipality of Madras; in 1890, as Acting Sanitary Commissioner, and again in 1893; yet to this day the Municipality of Madras is awaiting results in other towns, or seeking information as to the cost of a suitable apparatus. Surely, a town of 452,518 inhabitants should not thus be left unprovided!

In the matter of accommodation for treatment of infectious diseases, 39 municipalities report possession of permanent wards for the purpose, four that temporary sheds exist, and 11 that no structures are available. Under a special order by Government, rules for the construction of hospitals have lately been drawn up, in consultation with the Sanitary Engineer, and the opportunity will be taken of pressing the necessity for accommodation for infectious diseases upon the notice of municipalities not yet so provided.

In the case of the Town of Madras, the absence of accommodation in this respect is very marked. The only places available are at the hospitals for the treatment of ordinary diseases, and, irrespective of objections to this mode, especially in the case of small-pox, the positions of the hospitals are not convenient with respect to areas of the town to be served. In response to my urging this point this municipality has lately taken steps to have two infectious disease hospitals within reasonable reach of the two railway lines, so as to treat cases of pilgrims and others brought in by these routes.

Not a single municipality possesses a vehicle for the conveyance of infectious cases to hospital, although power of removal is given under the Act when suitable accommodation is not provided for those suffering from infectious diseases.

District Boards.

Under Act No. V. of 1884, the principle of local self government has been freely extended in the Madras Presidency. As far as possible, the constitution of bodies administering this Act has been made to fit into already existing institutions of the country, which required but little adaptation. Thus, from time immemorial, decisions in matters of importance have been decided in villages by committees known as "Punchayats." The Punchayats is an institution which the ordinary villager thoroughly understands; he has with similar committees been accustomed to see solemn and formal trials on questions of caste undertaken, and the administration of funds of temples effected. To make the already existing Headman the Chairman of the Punchayat, and to give him when necessary the aid of a trained secretary and accountant in the person of the karnam, already referred to under vital statistics, was an easy matter. To group villages according to their importance as to population was the next step, and this, naturally, secured the classification into unions and major unions. The duties of these respective bodies are thus defined:—

I. In all unions—
   (*a.*) Cleansing the village streets, drains, tanks, wells, and other public places in the union; and
   (*b.*) Generally doing such things as may be necessary for the preservation of public health.

II. In a major union—
   (*a.*) Making and repairing the village streets and drains in the union;
   (*b.*) Constructing and repairing such tanks and wells and other works as will supply the inhabitants of the union with a sufficient supply of water for domestic use.

The revenue division of a district into taluks was next utilized, and a Board constituted for the governing of the smaller bodies, which, in its turn, is under the direction of the District Board, a central body having for its president a collector of the district. This form of government has been received with considerable favour, and the position of a member of the District Board, or of the minor bodies, is rightly regarded by native gentlemen as one of honour. The result of extension of organisation beyond that provided for in the Madras Local Funds Act, No. IV. of 1871, has been a general impetus as to the conservancy of villages, a point that was essential; but I think it has also had the effect of limiting the power of the District Boards for making important sanitary improvement. This is due to the numerous allotments to the various bodies so that sanitary works must necessarily be of a minor nature. Thus, granting the Local Fund Board of former days had continued to exist unmodified, I

believe that probably less numerous, albeit superficial, attempts at village cleanliness would have been made; but, with the increasing interest which sanitary questions now have for educated men, I think the natural sequence would have been more frequent attempts to carry out comprehensive schemes of improvement. For example, it would have been possible to have taken up the larger non-municipal towns in districts, to have completely remedied their sanitary defects, and then to have launched them under the care of their own townsmen under municipal rule. I consider the necessary remedial measure to be that referred to by me under the section dealing with "Municipalities," namely, the supervision of expenditure upon sanitary works by a separate branch of the District Board, to be styled the District Sanitary Board. This addition to the organisation would in no way place the present system out of joint. Each "Punchayat" would still have its voice in any matter it was interested in duly attended to, by medium of a member elected for the time being; whilst it would secure that money is not expended upon minor sanitary works without professional advice. In short, the effect of decentralization, in this case, has been to practically prohibit the undertaking of large and important efforts for sanitary improvement, whilst it favours the expenditure of the whole sum available upon petty works without professional supervision. There thus seems, so long as existing arrangements continue, no opportunity for further advance.

Now, at first sight, an arrangement by which large numbers of wells could be improved or new sources of water-supply be placed at disposal under this system, must be of advantage; but inspections of such works shows that they are executed on the most primitive principles; a latrine is conceived as a structure fulfilling sanitary requirements when four walls are made to enclose an open earthen space, whilst a well sunk side by side with a drain is held to be a new water-supply to be proud of. Whilst therefore leaving to unions the collection of house taxes, the appointment and supervision of conservancy staffs, and the other duties now devolving upon them, I believe a new organization is requisite for the *purpose of concentrating* available funds, for some years to come, upon major works selected with regard to order of urgency in the whole district, and without respect to the limits of areas under unions.

The sanitary powers given under Act No. V. of 1884 are of so slender a character, that it would be to little purpose that Boards appointed executive sanitary inspectors. Provision is made for the supervision of private wells and streams; but the protection of public water supplies, prevention of the defilement of rivers by the burial of the dead in their river-beds and the like, and the prevention of infectious diseases are either matters that cannot be attended to at all, or only by appeal to Acts not administered by these Boards. Difficulties as to enforcing sanitation in villages near which magistrates are not stationed are evident; but it is to be hoped that the Act now under revision by Government will permit of much greater powers in these important matters, and that the appointment of sanitary inspectors will follow as a matter of course.

In regard to inspection of rural areas, I believe Madras holds a position that compares favourably with any other part of India. In 1881, the Government adopted the recommendation of Surgeon-General Cornish, C.I.E., formerly Sanitary Commissioner, by which to each district was attached assistant surgeons competent to take charge of the head-quarters of stations during the absence of civil surgeons, who then become district medical and sanitary officers, and were in a position not only at frequent intervals to inspect the very large number of hospitals and dispensaries under their control, but also to devote attention to the sanitary requirements of the various areas visited. Reports by these district sanitary officers who, as a rule, are commissioned medical officers, and have all received special training in hygiene at Netley, are forwarded to this office, and copies simultaneously are sent to the President, District Board, or other local authority concerned. These are of as concise a nature as possible, and deal with essential points only, as the funds at disposal of the Boards are of a very limited nature, and any attempt to dictate elaborate changes under their present organization would be of no utility. Where matters of unusual sanitary interest are investigated, sanitary officers are expected to send special reports to this office, and when found of general professional utility these are embodied and published in the "Minutes of Proceedings of the Sanitary Commissioner," issued quarterly by Government. Care is taken in this office to watch the action taken by the authorities concerned, with regard to the recommendations made.

There is one very decided drawback in this system at the present time which I trust may be overcome when in ordinary course my recommendations are placed before

Government, namely, the want of method as to preparation of the budgets. The majority of the Boards prepare these without giving the District Sanitary Officer an opportunity of making his recommendations. It is true the Sanitary Officer, as a member of the District Board, has the option of objecting to any item in the budget when it is brought before a general meeting; but, it obviously requires an unusually good head at finance to be able to tell a Board in a few minutes how, in view of a new proposal, the whole budget is to be re-arranged. A fair hearing *before* the budget is compiled is evidently what is required, and, for this purpose, the whole of the sanitary improvements suggested by the District Sanitary Officers and others during the previous year, that have been improved but not been sanctioned for want of funds, should be discussed side by side with new proposals. At the present moment, the advice of District Sanitary Officers is apt to be met with the constant statement "no funds available." This, of course, is a foregone conclusion, as the officer makes, under existing arrangements, suggestions for allotments of funds already devoted by the previous year's budget to specific objects. It therefore seems to me that it should be expected that Local Boards on stating "funds not available," should also add "the "subject will be registered for discussion prior to the compiling of the next year's "budget." An inspection of a native village conducted honestly in this country is no light task; many miles of country have frequently to be passed over, and odours have to be endured under a tropical sun that try physical, if not mental, endurance. It can easily, therefore, be conceived that an officer must be more than ordinarily persevering or sanguine not to feel discouraged, by his having his proposals constantly met by this stereotyped phrase "no funds."

Most District Boards have arranged to provide District Sanitary Officers with an itinerating subordinate staff to enable them to prescribe for villages at the points visited. The effect of this arrangement is beneficial, but only with respect to medical treatment (with which this office has no concern), but also in bringing Sanitary Officers face to face with the diseases peculiar to the neighbourhoods visited, and enabling them also to gauge, in a manner otherwise impossible, the habits of the people.

Whilst thus pointing to weakness in certain of the details of the system, there can be no doubt of the vast benefit conferred on the country by the inspections of these Sanitary Officers. It is found even where staffs of sweepers and scavengers are employed by unions, that unless at intervals the extent of working be ascertained, villages are apt to lapse into their old state of filth. The personal influence of the Sanitary Officer is a factor to be reckoned upon, and it is frequently found after explanation of the "why" and "wherefore" sanitary measures that would otherwise be a mystery to the mind of an union chairman become recognised, and are subsequently constantly acted upon. This applies not only to arrangements as to conservancy, but also to water supply. Very often from ignorance of simple facts as to surface and sub-soil drainage water supplies are subjected to the most gross contamination that the work of a single coolie for half an hour will remedy. In this manner, doubtless, much good work is performed that, by reason of its being remedied on the spot, does not find a record in district sanitary officers' reports. Further, in the course of his inspection, the sanitary officer is always surrounded by crowds of villagers intent upon ascertaining what is his object in staring at dirty gutters, and tracing their endings into drinking-water tanks, and thus many an *al fresco* lecture and friendly argument with the inevitable "village lawyer" afford matter for reflection and discussion for many days to come. All this represents good seed sown that will, in due season, bring forth good fruit. I need not add that the frequent inspections as to the quality of vaccination performed is also of the greatest utility in checking the working of the vaccination department which possesses an organization far behind the age, and that the scrutiny of village registration is also of value.

During the year 23 villages were formed into unions. There were at the end of the year 327 unions conserved under Act V. of 1884.

The nature of the work still before local fund bodies is sufficiently defined in the "estimate of villages;" it is evident that up to date the typical village methods of sewerage, water supply, and night-soil conservancy have a strange inter-dependence upon each other.

The total estimated income of the districts for 1893–94 was Rs. 78,93,344, against Rs. 79,04,903 in 1892–93, and of this sum, Rs. 6,27,907, or 7·9 per cent. was allotted for sanitary purposes. During the last nine months of 1893, 55·4 per cent. of the assignment was expended.

General Remarks.—Defilement of water of the most gross and repulsive character is *the* sanitary error found everywhere, and is the prime cause of the great incidence of water-borne diseases in the country. It must not, however, be considered that the habit of defiling water is the result of simple carelessness, or of unthinking filthy habits. There is fast fixed in the minds of uneducated natives the impression that "water purifies itself," and, therefore, *cannot* be contaminated. This idea is founded upon a perversion of the Shastras, which make certain statements as to running water, but are, nevertheless, most scrupulous in insisting upon defilement not being permitted. It is, however, with this idea that the housewife will contentedly take water for household consumption from a spot where a native of a caste, whose mere touch would be considered to pollute, is in the act of washing his body or clothing. Perhaps, one of the best ways of bringing conviction home would be by placing before the young in school the actual readings of the Shastras on this point, and interpreting them correctly by the light of modern day knowledge. This idea was grasped by the late Surgeon-General Furnell, a former Sanitary Commissioner for Madras, in a lectnre which was given by him, that subsequently had wide publicity, and did much good; but, luckily, the prevention of defilement of water is a matter more under public control than that of the soil. Whether the supply of a town be on a scale to permit of the term "water-works," or on the humbler method from wells, it is possible by mechanical arrangements to effect protection. Moreover, in dealing with this most urgent requirement of the country, it is not necessary to wait for the development of public opinion. Notwithstanding the curious idea referred to, natives undoubtedly prefer a water that has not been taxed to exhibit its—according to them—inherent powers of purification ; a pure public water-supply being always much appreciated ; nevertheless, in dealing both with municipal and rural communities, it is absolutely necessary, in view of the want of familiarity with methods of securing protected water supplies, that all arrangements be made under supervision; were native communities left to their own guidance, I feel sure that 99 per cent. of the schemes they would favour would be founded upon a system of open tanks fed by open channels, and it is in this respect that the guidance of the Sanitary Board should prove of benefit.

In out-of-the-way villages experience shows that not a little opposition may at first be expected in effecting changes. The villager regards it as little short of desecration that the open "step-well" that his forefathers have used before him should be altered, so as to prevent his descending and washing his clothing or feet there. Here, then, it may be said that sanitary efforts should "hasten slowly." I have, however, made it my business to exchange views freely with the uneducated native, and I am fully convinced that these prejudices which some hesitate to ride over, are matters very easily got rid of, care being taken to distinguish between opposition founded upon real—not fancied—caste principles and mere ignorance. In short, I consider most so-called "prejudices" are not prejudices at all—they represent sentiments founded upon a scanty supply of facts within a very limited plane of knowledge, and consequently, to remove these difficulties, the policy that should be followed is not to "hasten slowly," but to *demonstrate practically.* Of what use is it attempting to persuade an uneducated man, who has never in his life seen an iron pipe or pump, that he will benefit by his open tank being enclosed, and that in future, instead of the women dipping their feet, hands, and pots into the water, it will be brought unpolluted to a certain point in an iron pipe, and there be rendered available without the necessity of dipping. He can conceive nothing of the matter—except that by some wretched new-fangled system, the face of the old village tank, he has known from his boyhood is about to be changed—hence, necessarily, opposition. Let, however, the work be executed—let the fact be *demonstrated* that pure water is now delivered in place of the filthy mixture formerly available, and there is no more grateful person than the villager—that which was before incomprehensible having been duly demonstrated. In short, I am of opinion that the greatest factor in preventing sanitary advance in this country is not prejudice—caste in other words—but the absence of familiarity with the methods generally dictated. To secure this end, one of the measures advisable would be the starting of a Museum of Hygiene in Madras, as long advocated by me, where the general public, and the members of our various local bodies could examine specimens of various sanitary mechanical adjuncts, diagrams, working models, &c. There would be no fear of such a museum not being well utilized; many thousand natives "from the country" yearly satisfy their curiosity by visiting the present Natural History Museum. If Government would also go to the probably small expense necessary, I believe much good could be effected by myself and my deputy, were we provided with models and diagrams with which lectures, to be given whilst on tour in different towns, could be illustrated.

But the matter is far different with respect to the utilization of night-soil. If agriculturists could but be persuaded that the use of night-soil is of utility, the question of conservancy would become a very simple matter. Here, unfortunately, caste prejudices are really in the way; but it is also apparent that in localities where the agriculturist has become convinced that the use of such manure tends to his monetary profit, he discovers methods by which a safe compromise can be effected. Thus, near Madras, men of the highest caste will journey to the night-soil depôt to bargain for manure, and will arrange for the purpose of undiluted night-soil at Rs. 1–15–0 per cart load, against As. 13 for a mere mixture with town rubbish. The case of Madras is by no means a solitary example; in the Ceded Districts the value of such manure is fast being recognized. The only point required is that it shall be demonstrated to the ryot that it is worth his while making the compromise. In this light, therefore, I have urged municipalities, where ryots still refuse to purchase, to enter upon arrangements for cultivating trenched grounds themselves—if for no other purpose, to, at least, exhibit by actual contrast with ground not so treated, in view of the public, the value of night-soil. Were such a Kindergarten system faithfully worked out by municipalities and by district boards in certain of the unions, I have no doubt difficulty as to disposal of night-soil would gradually disappear and with it "caste prejudices." In certain tracts, however, irrigated by rivers bearing much silt, the ryot will probably never change his views, as the soil can well bear crops without artificial aid; and here it will be necessary to introduce cheap incinerators for the destruction of rubbish, and it may be the manufacture of poudrette for export to less favoured localities. Calicut, an important town of 60,000 inhabitants, has already embarked in an experiment in this direction, and Masulipatam will make a similar effort.

In many unions ryots are utilizing town rubbish, and this is always rich in night-soil. The income derived from the sale of sweepings also proves the fact that considerable attention is given to the matter by municipalities. On the whole, advance has occurred in this respect during the year, and better results may, in the future, be confidently looked forward to.

General Remarks and Personal Proceedings.

Surgeon-Lieutenant-Colonel J. A. Laing, the incumbent of this office, held charge up to the 29th August, 1893. He unfortunately left me no notes as to the sanitary progress effected under his charge during the year, and I, therefore, regret I am not able to give a sufficiently detailed account of his, doubtless, numerous endeavours to this end. From records, however, I find that during eight months he inspected 14 municipalities. He also inspected and furnished notes upon 29 rural localities. He was deputed by the Madras Government in the month of April 1893 to examine and report upon various proposals for the water supply of Bangalore.

Surgeon-Major D. F. Dymott inspected 16 municipalities. He also reported upon 14 rural localities.

I took charge of my appointment as Acting Sanitary Commissioner on the 29th August. I found there were 26 municipalities to inspect during the remaining four months of the year. Of these, I inspected and reported upon 11.

I reported as to the rural localities of Dhone, Veldurti, Noonapillay, Mala village near Nandyal, Nandyal and Peddapad, and inspected Needamangalam and Beypore, but had not presented notes on the two latter at the end of the year.

I was much delayed on my jonrney both northwards and southwards by floods, and found it impossible to complete the inspection of the town of Madras, which covers an area of 27·29 square miles within the calendar year. This was, however, duly commenced by the end of December. A report will be furnished shortly, but it has not been considered necessary to hurry this matter, as the municipal commissioners of Madras had not by the end of 1893 dealt with my predecessor's report of 1892.

I also inspected Government House (Guindy) water supply, and made special investigations on the spot as to the cholera epidemic of Tirupatti, Trichinopoly town, and Trichinopoly jail. At the request of the inhabitants, lectures on sanitary subjects were delivered by me at Guntúr and Bezwada. In both instances, the members of the municipal council and the chairmen attended.

Surgeon-Captain W. B. Bannerman completed the inspection of 14 municipalities. Inspection notes also were furnished by him as to the rural areas of Chendragiri, Arcot, and Ranipet.

SANITARY ENGINEERING DEPARTMENT.

During the year surveys in connexion with water supply or drainage were completed in three municipalities, as against nine in 1892, and two were still in progress at its close. Out of the 55 municipalities in the Presidency, surveys or levels have now been taken for 36 towns. Schemes for the improvement of water supply in two towns, and of drainage in one were submitted to Government for sanction; the estimated cost of these was Rs. 6,84,000. Information was also obtained for the preparation of drainage schemes in four towns, water supply in three towns, and water supply and drainage in seven towns. Seven water supply and two drainage works, estimated to cost Rs. 16,40,000, were in course of construction. Of these the Cuddapah water supply and Coonoor drainage works were completed; the waterworks at Madura progressed fairly, and the drainage scheme of Kumbakonam approached completion. The occurrence of heavy floods in November 1893 destroyed the whole of the Trichinopoly waterworks, and caused considerable damage to those at Tanjore. The Adoni waterworks were commenced during the latter part of the year. The tunnelling works at Dindigul, and the boring works at Cochin, sanctioned by Government for execution from provincial revenues, also progressed fairly well. Of the 13 schemes previously presented, the following were sanctioned for execution:—Negapatam drainage scheme, Cuddapah drainage channel, Adoni waterworks, Kurnool waterworks, Dindigul tunnelling works, and Cochin experimental boring. The water supply schemes for Bellary, Ongole, Cocanada, and Vellore, were abandoned owing to the inability of the municipalities concerned to finance them. The drainage scheme of Tirupati, and the water supply schemes for Coonoor and Coimbatore were also not financed during the year. One hundred and twenty-three plans and 150 estimates for sanitary works to the value of Rs. 2,75,350 were scrutinized during the year, as compared with 165 plans and 202 estimates to the value of Rs. 2,17,708 in 1892. New designs were furnished for one hospital, one market, and one slaughter-house, besides 11 miscellaneous plans, and new type drawings for a roofed double iron latrine (dry earth system), and an iron latrine for a rural population were prepared and issued to each municipality. Reports were also submitted regarding the construction of side-drains in Hospet (Bellary), and the improvement of the water supply of Saidapet, the Government House at Guindy, and the Coimbatore and Rajahmundry jails. During the year Mr. Cousins' suggestions for the improvement of the water supply and drainage of Madras, and for the improvement of the River Cooum were received, and the Sanitary Engineer submitted his remarks thereon. The matter was still under the consideration of Government at the close of the year.

ABSTRACT OF REPORT OF THE SANITARY COMMISSIONER FOR BOMBAY FOR 1893.

(*Dr. C. W. MacRury.*)

General Population.

Regarding the arrangements made for testing the record of vital statistics by the vaccination staff, a considerable improvement, in rural circles, has taken place in the registration of births; but the cause of vaccination has thereby suffered, inasmuch as vaccinators incur the displeasure of the village officials whenever they report omissions in the birth registers for which the registrars may be fined or otherwise punished, the result being that the vaccinators lose the influence and support of the village officers in collecting children for the purpose of being vaccinated. In this respect, therefore, the experiment cannot be pronounced a success, as the gain to birth registration is loss to vaccination, which must be popularised at all hazards, and this cannot be done if the vaccinator is feared more than loved by the multitude, and especially the village officials. Vital statistics.

Births.—In the Presidency of Bombay, including Sind, during the year 1893 there were 664,305 births registered against 650,667 in 1892. The recorded births for the year under report were thus 13,638 more than the number registered in the previous year, and exceeded the mean of the preceding 10 years ending 1892 by 61,471. By sexes there were 345,424 males and 318,881 females against 337,150 and 313,517 respectively in 1892.

The following table shows the number of births registered in each year from 1883 to 1893, their ratios per 1,000 of population, and the proportion of males to females:—

Years.	Population.	Number of Births Registered.			Ratio per 1,000 of Population.			In every 100 Births there were		For every 100 Male Births the Females were
		Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	
1883 - - -	16,454,414	261,966	239,835	501,801	15·92	14·58	30·50	52·20	47·80	91·55
1884 - - -	16,454,414	278,986	255,737	534,723	16·96	15·54	32·50	52·17	47·83	91·67
1885 - - -	16,454,414	298,406	274,025	572,431	18·14	16·65	34·79	52·13	47·87	91·83
1886 - - -	16,454,414	303,376	278,177	581,553	18·44	16·90	35·34	52·17	47·83	91·69
1887 - - -	16,454,414	327,500	300,693	628,193	19·90	18·27	38·18	52·13	47·87	91·81
1888 - - -	16,454,414	330,316	304,377	634,693	20·07	18·50	38·57	52·04	47·96	92·15
1889 - - -	16,454,414	312,974	287,515	600,489	19·02	17·47	36·49	52·12	47·88	91·87
1890 - - -	16,454,414	333,698	307,417	641,115	20·28	18·68	38·97	52·05	47·95	92·14
1891 - - -	18,820,346	354,630	328,047	682,677	18·84	17·43	36·27	51·95	48·05	92·50
1892 - - -	18,820,346	337,150	313,517	650,667	17·91	16·66	34·57	51·82	48·18	92·99
Mean for 10 years	16,927,600	313,900	288,934	602,834	18·54	17·07	35·61	52·07	47·93	92·05
1893 - - -	18,820,346	345,424	318,881	664,305	18·35	16·94	35·30	52·00	48·00	92·32

The recorded birth-rate for the year was 35·30 per 1,000 of population against 34·57 in 1892, and a mean of 35·61 for the previous 10 years.

By months the greatest number of births (62,282) was registered in October, and the least (45,085) in February. In 1892 the highest and lowest numbers (61,727) and (47,699) respectively were registered in the months of June and February.

Of the 24 collectorates and districts, the number of recorded births in 1893 was higher than in 1892 in 15, viz., Khándesh, Thána, Kolába, Ahmednagar, Poona, Sholápur, Belgaum, Dhárwár, Bijápur, Surat, Broach, Panch Maháls, Hyderabad, Thar and Párkar and Upper Sind Frontier. The remaining 9 collectorates show a decrease as compared with 1892. The registration of births throughout the Province of Sind is apparently defective, especially in Thar and Párkar district and Hyderabad collectorate. The City of Bombay again shows nearly the same recorded birth-rate (18·48 per 1,000) as last year (18·87) and is less than the mean of the past 10 years, which is 19·40 per 1,000. If this is even approximately correct, it shows that Bombay,

as regards increase of population, must, like most large and busy towns, rely on the mofussil for recruits to fill the gaps caused by the fierce struggle for existence.

The recorded birth-rates among the urban and rural populations of the Presidency were 27·97 and 36·32 against 28·24 and 35·46 in 1892. Except in the collectorates of Ahmednagar, Ratnágiri, Bijápur, Kánara, Karáchi, Hyderabad, Shikárpur, and Thar and Párkar district, the birth-rates were higher amongst the rural than in the urban population. It was the same in 1892, with the exception of Ahmednagar, Ratnágiri, Dhárwár, Bijápur, Karáchi, Hyderabad, Thar and Párkar, and Shikárpur. In the collectorates of Dhárwár and Kaira the birth-rates among the rural and urban populations were nearly the same—41·10 and 41·31 respectively for the former and 31 84 and 31·57 for the latter.

Out of 56 towns in the Presidency 17 had a birth-rate exceeding 40 per 1,000. Attention has been repeatedly drawn to the low birth-rate shown by such towns as Thána, Násik, Bombay, Kaira, and Alibág.

Deaths.—Among the civil population in the rural, town and cantonment circles in the Presidency, 511,831 deaths were registered during the year 1893. In 1892, 611,742 deaths, or 99,911 more than in 1893, were recorded.

The following statement shows the number of deaths recorded in each year since 1883:—

1883	- -	420,198	1887	- -	455,261	1891	- -	513,132
1884	-	408,409	1888	- -	468,039	1892	- -	611,742
1885	- -	473,591	1889	- -	518,562	1893	- -	511,831
1886	- -	381,185	1890	- -	463,616			

Of the total deaths registered, 266,554 occurred among males, and 245,277 among females, against 317,031 and 294,711 respectively in 1892.

The computed death-rate per 1,000 of population in 1893 was 27·20 against 32·50 in 1892, and a decennial mean of 27·84. The millesimal ratio of males dying to males living was 27·37, and of females dying to females living 27·00. In 1892 these ratios were respectively 32·56 and 32·45. For every 100 females who died 108·67 deaths among males were recorded, but these proportions varied considerably in the following collectorates:—

In the City of Bombay	the ratio of male	to female deaths	was 115·40 per cent.
„ Kánara	do.	do.	114·08 „
„ Broach	do.	do.	110·58 „
„ Kaira	do.	do.	114·55 „
„ Ahmedabad	do.	do.	112·83 „
„ Karáchi	do.	do.	123·92 „
„ Hyderabad	do.	do.	123·83 „
„ Thar and Párkar	do.	do.	125·53 „
„ Shikárpur	do.	do.	116·72 „
„ Upper Sind Frontier	do.	do.	121·24 „

In 1893 the recorded death-rates per 1,000 of population were lower than in 1892 in all the collectorates except Khándesh, Ahmednagar, and Sholápur, which is chiefly due to the prevalence of cholera in these collectorates. The recorded death-rate per 1,000 of population in 1893 was higher than the annual mean of the preceding 10 years in the collectorates of Khándesh, Kolába, Ahmednagar, Poona, Ratnágiri, Surat, Broach, and Kaira. The death-rate in the collectorates of Násik, City of Bombay, Sholápur and Kánara, was nearly the same as that of the annual mean of the preceding 10 years. In the remaining collectorates the death-rate was lower than the annual mean.

The death-rates by collectorates ranged from 38·00 per 1,000 of population in Broach to 14·62 in Hyderabad. In 1892 the maximum and minimum ratios (47·51 and 20·93 per 1,000 respectively) occurred in Ahmedabad and Ratnágiri.

According to age, the mortality amongst infants under one year and children above one year but under five was, as usual, very high in comparison with other periods of life, the death-rate amounting to 43·53 per cent. of the total deaths. The period of greatest immunity was as last year in the age period of above 10 and under 15, the rate being 7·44 living or 2·65 per cent. on the total deaths. The percentage on total deaths amongst infants under one year was 21·64 against 19·95 in 1892. For those above one and under five the percentage on total deaths was 21·89 against 20·92 in 1892. Among old people of 60 and upwards the percentage on total deaths was 14·30 against 14·07 in 1892.

According to the census of 1891, the Mahomedan population numbered 3,501,910 persons amongst whom, in 1893, 72,223 deaths were recorded against 116,987 in 1892, the death-rate being 20·62 per 1,000 of population against 33·41 in 1892. The Hindu population amounted to 14,897,629 persons, amongst whom 433,735 deaths or 29·11 per 1,000 of population were recorded. In 1892 the total deaths amongst this race were 487,917, equal to a death-rate of 32·75 per 1,000 of population. Amongst the Christian population, numbering 122,089 persons, 2,506 deaths were reported during the year against 2,711 in 1892, the death-rate being 20·53 against 22·21 per 1,000 in 1892. Under the heading "Other Castes" are included all those not belonging to either of the above sects who by the census of 1891 numbered 298,718 persons, amongst whom, during 1893, there were 3,367 deaths against 4,127 in 1892, the death-rate being 11·28 per 1,000 against 13·82 in 1892. Among Mahomedans the maximum death-rate during the year (39·75 per 1,000) took place in the collectorate of Surat, and the minimum (13·67) in Hyderabad. In 1892 the maximum death-rate was 44·51 per 1,000 in Ahmedabad, and the minimum 17·81 in the Khándesh. Among Hindus the maximum death-rate (37·58 per 1,000) was in the collectorate of Ahmednagar, and the minimum (15·82) in Thar and Párkar. In 1892 these rates were in Ahmedabad (47·91) and Ratnágiri (20·82) respectively. The maximum death-rate during the year amongst Christians was 41·67, and was reported from the Panch Mahals, and the minimum (5·15) from Ahmednagar. In the collectorates of Sátára, Broach, Thar and Párkar, and Upper Sind Frontier no deaths amongst Christians were reported in 1893.

The subjoined table shows the deaths in 1893 arranged according to the specified causes laid down by the Government of India, and contrasted with the results for 1892 and the mean of the preceding 10 years. The causes of deaths will be briefly noticed in the next section:—

Causes of Deaths.	Mean for 10 Years, 1883–1892.		1892.		1893.	
	Number.	Ratio per 1,000 of Population.	Number.	Ratio per 1,000 of Population.	Number.	Ratio per 1,000 of Population.
Cholera - - -	24,783	1·46	42,900	2·28	18,853	1·00
Small-pox - - -	5,298	0·31	2,770	0·15	3,567	0·19
Fevers - - -	325,132	19·21	438,038	23·27	361,160	19·19
Dysentery and diarrhœa - -	39,836	2·35	35,406	1·88	32,965	1.75
Injuries - - -	5,724	0·34	5,432	0·29	6,144	0·33
Other causes - - -	70,599	4·17	87,196	4·63	89,142	4·74
All causes - -	471,372	27·84	611,742	32·50	511,831	27·20

Chief Diseases.

Cholera caused 18,853 deaths during 1893 throughout the Presidency, or 24,047 less than in the preceding year. The epidemic prevailed chiefly in the Surat, Khándesh, Sátára, Sholápur, Ahmednagar, Kaira, Poona and Broach collectorates, where 3,754 or 5·77, 2,308 or 1·58, 1,865 or 1·50, 1,753 or 2·33, 1,745 or 1·96, 1,584 or 1·81, 1,195 or 1·12, and 1,147 or 3·35 deaths per 1,000 of population respectively took place; whilst the minimum mortality occurred in the Karáchi, Thar and Párkar district, Kánara and Dhárwár collectorates, in which there were 1, 2, 5, and 94 deaths respectively registered. Cholera.

In December 1892, deaths from cholera were reported from 11 collectorates, including Ratnágiri, Belgaum, and Broach. In these three collectorates only the disease continued in January of the present year, and 84 deaths were reported. In February the disease prevailed in three collectorates, causing 48 deaths, the monthly minimum for the year, and disappeared from three collectorates, namely Sholápur, Sátára, and Belgaum. In March 256 deaths from cholera were returned from four collectorates. In April the disease increased, and caused 3,270 deaths in 12 collectorates. In May it assumed a still greater intensity, and caused 3,607 deaths, of which 2,650 occurred in four collectorates, namely, Surat, Broach, Kaira, and Panch Mahals. In June and July a fall took place and 1,742 and 1,816 deaths were reported respectively, but in August the disease assumed an epidemic form, as the mortality rose to 5,104, the maximum for the year, and was present more or less in 18 zillas. There was a decrease in the

month of September, 1,661 deaths having been reported. In October and November it rapidly subsided, as there were only 841 deaths in the former, and 365 in the latter month. In December the disease abated considerably but lingered in nine collectorates and caused 59 deaths. Hyderabad, Shikárpur, and Upper Sind Frontier were free from cholera throughout the year.

In the Surat, Broach, and Sholápur collectorates, the death-rate attained the high ratios of 5·77, 3·35, and 2·33 per 1,000 of population respectively. In Ahmednagar, Kaira, Khándesh, Sátára, Panch Maháls, Poona, and Násik collectorates, the ratios were 1·96, 1·81, 1·58, 1·50, 1·28, 1·12, and 1·10 respectively. The epidemic although widely prevalent did not show any very serious severity in other parts of the Presidency.

Out of the 25,143 villages in the Presidency 1,582 or 6·29 per cent. were affected by cholera. The highest percentage took place in the Surat collectorate, where out of the 795 total villages 266 or 33·46 per cent. were affected. In Khándesh, out of 2,824 total villages, the disease appeared in 224 or 7·92 per cent. In the Broach, Sholápur, Kaira, Sátára, Ahmednagar, and Poona collectorates the percentages were respectively 24·32, 19·07, 18·65, 12·58, 11·38, and 9·60; whilst in the remaining 11 collectorates the percentages were below 6.

Small-pox. During 1893 there were 3,567 deaths from small-pox (1,769 males and 1,798 females), against 2,770 in 1892 and a decennial mean of 5,298.

The Western Registration District attained a ratio of 0·39 per 1,000, against 0·31 in 1892, and a decennial mean of 0·44. In the Southern Registration District the ratio was 0·26 against 0·23 in the previous year, and 0·50 the decennial mean. In the Central Registration District it was 0·17 against 0·10 in the previous year, and a decennial mean of 0·23. In the Gujarát and Sind Registration Districts the ratios per 1,000 of population were respectively 0·01 and 0·01 against 0·02 and 0·02 in the previous year, and a decennial mean of 0·13 and 0·24. In collectorates the highest death ratio, 0·78, took place in the Thána collectorate and 0·55 in the Kolába collectorate and the lowest 0·01 in the Kaira, Ahmedabad, and Shikárpur collectorates. The districts of Broach, Hyderabad, Thar and Párkar, and Upper Sind Frontier, were free. The Presidency rate was 0·19 against 0·15 in the previous year, and 0·31 the decennial mean.

Of the total small-pox deaths, 24·67 per cent. occurred among infants under one year of age, whilst 54·25 per cent. took place among children over 1 and under 12, the remaining 21·08 per cent. being among persons over 12 years of age.

Fever. During 1893, 187,009 males and 174,151 females, or a total of 361,160 persons, were reported to have died from fever, against 438,038 in 1892, showing a marked decrease of 76,878 deaths for the year, the mean for the previous 10 years being 325,132.

In the Gujarát Registration District fever caused a high mortality, 26·56 per 1,000 during the year against 34·89 in 1892, and the decennial mean 26·20. In the Central Registration District the death ratio was 19·15, against 19·62 in the previous year, and 18·24 the decennial mean. In the Western Registration District the ratio for the year was 18·53 against 20·29 in the previous year, and 18·92 the ten years' mean. In the Southern and Sind Registration Districts the respective ratios for the year were 16·39 and 15·56, against 18·24 and 27·63 in the previous year, and 15·89 and 17·14 the 10 years' mean. Excepting Khándesh and Ahmednagar, in every collectorate a marked decrease is observable on that of the previous year, and in 11 collectorates it was above the average rate of 19·19. The collectorate of Broach heads the list with the very high ratio of 30·57, against 35·06 in 1892, and 31·44 in the previous 10 years. In the following collectorates high death ratios were recorded:—Kaira 28·22, Ahmedabad 27·84, Ahmednagar 25·82, Khándesh 25·53, Surat 23·88, Násik 21·73, Sholápur 21·24, Sátára 20·29, Panch Maháls 19·37, and Poona 19·29, the Presidency rate being 19·19 against 23·27 in the previous year and 19·21 the decennial mean.

Excepting in the months of May and August, the deaths from this cause were below the corresponding months of 1892, yet throughout the year they were above the mean. The maximum mortality from fever took place in November, when 35,324 deaths were reported, and the minimum in June, when 25,260 deaths were recorded from this cause.

Compared by districts and collectorates excepting Khándesh and Ahmednagar, and compared by months excepting May and August, it will be seen that there was a great decrease in the number of deaths from fevers during the year on that 1892. In explanation of this decrease in the Gujarát Registration District, the Deputy Sanitary Commissioner says:—"That in 1893 the mean temperature was lower, that the rainfall,

" though greater in Broach and Godhra, was on the whole less, and that food grains " were cheaper than in the previous year."

The Deputy Sanitary Commissioner, Western Registration District, says :—" I can " assign no cause for any increase or decrease in the number of fever except the " variation in the seasons, the improvements being very slowly made in general " sanitation and the prosperity of the people; in some districts where money has been " made from cotton crops, &c., people who used to live in small houses, now have " large double-storied houses as in Bhadgaon."

Dysentery and diarrhœa

During 1893, dysentery and diarrhœa caused the deaths of 18,224 males and 14,741 females, or a total of 32,965 persons against 35,406 in 1892, and a decennial mean of 39,836.

The Southern Registration District heads the list with a ratio of 2·88 per 1,000 against 4·37 in 1892, and 4·78 the decennial mean. The Western Registration District comes next with a ratio of 2·71, the Central Registration District 2·01, the Gujarát Registration District 0·26, and the Sind Registration District 0·10. In the Presidency the rate was 1·75 against 1·88 in the previous year and a decennial mean of 2·35. In the collectorates of Khándesh, Násik, Ahmednagar, Poona, Sátára, Ratnágiri, Kánara, Hyderabad, and Thar and Párkar District, the death-rate for the year was slightly higher, and in the rest it was below 1892. The highest ratios were recorded in Belgaum 4·28, Násik 4·03, Khándesh 3·75, and the lowest in Shikárpur 0·03 and Panch Maháls 0·02.

During the year in March, April, and August, the deaths from dysentery and diarrhœa exceeded those recorded in 1892, but in the other months they were less. The maximum mortality occurred in August and the minimum in February.

Injuries.

During 1893, 3,579 males and 2,565 females, or a total of 6,144 persons, met with violent deaths. The mortality from these causes is more by 712 than that reported in 1892, when 5,432 deaths were recorded. Of the 6,144 deaths, 2,721 happened from drowning, 1,282 resulted from snake bites, 542 from wounds, 173 from hanging, 110 from poisoning, 71 from attacks by wild beasts, and 1,245 from causes not specified.

Other causes.

The recorded deaths from causes other than those specified number 89,142, of which 46,105 occurred among males and 43,037 among females. The total for 1892 was 87,196. There is an increase of 1,946 under this head.

Sanitary Works—Military and Civil.

All available information under these sections has been thrown into a tabular form, and will be found in Appendices Nos. V. and VI.,* as directed in paragraph 5 of Government Resolution No. 3393, General Department, dated 28th September 1888.

Personal Proceedings and General Remarks.

I returned from 18 months' furlough on the 19th and assumed charge of my office on the 20th November 1893.

Progress in sanitary reform is slow, and this arises not so much from want of funds, as the apathy and ignorance of municipal authorities, who in many instances do not make the best of the ways and means at their disposal. It makes a considerable difference whether a collector and his assistants keenly interest themselves personally in the sanitation of their districts, or delegate such matters to local self-government. In the former case, a certain amount of attention is given to recommendations, followed by improvement; whereas in the latter, promises of reform are made which are never fulfilled. There is no greater delusion than to suppose that Natives alone and unguided can carry out sanitary improvements. The supervision of European officials as well as their sympathy and support are, in my opinion, indispensably necessary in all matters bearing on the health of the public.

Infants are peculiarly sensitive to insanitary surroundings, but more especially to impure air, which kills a large number, if not the majority of them, during their first year of existence. Improved drainage, ventilation, and general cleanliness, would to a great extent remedy this evil, and trained nurses would, in my opinion, be the means of saving the lives of many mothers and children; prevention of the spread of puerperal fever alone would save many women of the child-bearing age. This subject has not attracted the attention it deserves from the leaders of native

* Not reprinted.

public opinion, who aim at securing the services of highly qualified "Prescribing ladies" (as I have heard them called by the most philanthropic lady of this or any age) instead of humble but valuable nurses, who are so urgently needed by poor and suffering women in every town and village in India.

The conditions and circumstances of health and life in Bombay have no doubt improved of late years, but are not yet what they should be when a mortality of 427·56 per 1,000 births occur among children under one year of age,

A Frenchman, named Chardin, writing of Bombay 60 years ago, said: "Ce pays si "malsain, ou-l' on fumait le cocotiers avec du poisson pourri, *et, ou deux saisons etaient "la vie d'un homme.*"

The deadly island has changed into a city of palaces, mills, and docks since then, but it is doubtful whether "underground Bombay" is so clean and sweet as when M. Chardin wrote. If he visited the city now, he would find sewer pipes unsupported in water-logged soil, and might well express astonishment at the amount of money expended on drains for storm-water, which might have been better guided on the surface to the nearest outfall.

Sanitary Board.

In the beginning of the year under report, the Sanitary Board travelled through Sind and gave advice to the municipalities of Jacobabad, Shikárpur, Sukkur, Hyderabad, and Karáchi. After the completion of their tour in Sind, they passed through the Deccan and inspected the sanitary condition of Sholápur, Bijápur, Gadag, Bársi, Belgaum and Ahmednagar. In the Konkan, they visited Kalyán, Thána, Nowpára, and Murbád.

The Board drew out a plan of a rubbish and night-soil depôt, and copies thereof were distributed to different municipalities. The plan is only meant to show the general lines on which a depôt should be laid out, but the distribution of the pits, &c., can be altered to suit local circumstances as regards the nature of the ground, &c.

During their tour of inspection in the South Deccan the Board inspected the sanitary condition of the town of Gadag-Bettigeri and found the drainage in a very insanitary condition. This was brought to the notice of the collector of the district, who requested the Board to depute a surveyor to frame an estimate for a contour survey. This was complied with, and the estimate was sent to the collector, but nothing further has been heard about it.

Government in the Public Works Department in their Resolution, No. 168 C.W.—641 of 24th April 1893, were pleased to appoint a Committee to report on and select a site for a lunatic asylum at Nowpára near Thána. Both the members served on the Committee and, having visited the place on more than one occasion, gave their opinion on the different points brought to their notice.

By Government Resolution in the Military Department, No. 452 of 4th March 1893, a Committee was appointed to inquire into, and report on, the insanitary condition of Poona and Kirkee and their surroundings, and the members of the Board submitted their reports on the matter.

In accordance with Government Resolution in the Public Works Department, No. 17 C.W.—48 of 18th July 1893, the Committee therein appointed to report on the drainage works of Poona City and Cantonment submitted a report, and the members of the Board laid their views before Government.

The Board prepared a plan of slaughter-house far small towns, and copies have been sent to different municipalities.

ABSTRACT OF REPORT OF THE HEALTH OFFICER OF THE PORT OF BOMBAY.

The following table gives a summary of the shipping and health of the Port of Bombay and of the work in connexion therewith for the year ending 31st December 1893 :—

Vessels including Native Craft.	Number.	Number of Passengers as far as is known.	Number of Vessels inspected.	Number of Persons, including Crew, inspected.	Number of Vessels disinfected.	Number of Persons vaccinated.	Diseases and Number of Cases of each.					Number of Boats with foul or rotten Cargo.
							Cholera.	Small-pox.	Measles.	Chicken-pox.	Equine diseases (glandered horses).	
Entered	47,357	417,071	23	18,392	15	2,168	23	22	10	9	2	—
Left	38,480	366,407 Including Harbour Population.	642	78,307	2	—	—	4	—	1	—	—
In harbour, during year	1,333	22,142	17	—	17	128	13	3	1	11	—	—
Total	86,170	805,620	682	96,699	34	2,296	36	29	11	21	2	—
1892	86,003	806,026	719	99,090	42	844	17	19	9	2	—	3

In the above table the number of crew on board ships entering the harbour during the year is not shown, as no record is kept.

The discrepancy between arrivals and departures is explained by harbour boats arriving from across harbour with wood, grass, and other cargo. On arrival they are noted, and having discharged their cargo, depart for similar cargo without being noticed.

Of the 417,071 passengers who are shown in the foregoing table, 10,934 were troops, 9,015 Mecca pilgrims, and the remaining 397,122 principally passengers from ports in close proximity to Bombay.

Infected Arrivals.—The following table shows the number of ships which had infectious disease on board on or before entering the harbour :—

Class of Vessels.	Number of Ships.	Total Number of Crew and Passengers.	Diseases and Number of Cases of each.				Number of glandered Horses.
			Cholera.	Small-pox.	Measles.	Chicken-pox.	
1. Troop ships	1	1,610	—	—	10	—	—
2. Pilgrim ships	6	3,454	23	18	—	1	—
3. Other vessels	6	1,469	—	4	—	8	—
4. Vessels which arrived with glandered horses	2	231	—	—	—	—	2
Total	15	6,764	23	22	10	9	2
1892	17	6,497	4	10	3	2	—

The above table does not include the cases of infectious disease which occurred on vessels in the harbour or among the harbour population.

The cases of measles on board of Her Majesty's Indian troopship were landed and isolated in the Military Cantonment at Colába. The pilgrim and other ships with small-pox were only detained until all on board not protected by previous small-pox or vaccination had been vaccinated and the vessels thoroughly disinfected.

During the year 2,168 persons on board such vessels were vaccinated.

The 23 cases of cholera noted had occurred on board four pilgrim ships during their voyage from Jeddah to Aden and Karáchi. They returned to Bombay free from cholera. Out of these 23 cases only two recovered. These vessels were on arrival disinfected as thoroughly as possible.

Only two vessels with glandered horses arrived during the year. These vessels were disinfected, as advised by the Veterinary Surgeon appointed for the harbour.

No vessels arrived with suspicious cargo, such as hides of cattle supposed to have suffered from contagious cattle-disease, or rotten fish, &c., during the year.

The following table shows the total number of vessels bound for all quarantine ports which were inspected and granted Form B. Bill of Health during the year 1893 :—

Class.	Number of Vessels.	Tonnage (Net).	Total Number of Crews, Passengers, Pilgrims, and Troops.
1. Square-rigged vessels and steamers - - -	421	811,460·60	39,713
2. Native sailing craft - - - - -	172	20,036·65	3,922
3. Pilgrim ships - - - - - -	30	36,154·39	22,230
4. Her Majesty's Indian Troop, marine ships, and men of-war - - - - - -	19	62,060·50	12,442
Total - - -	642	929,712·14	78,307
1892 - - -	664	941,668·88	75,659

In addition to the above, Form C. Bill of Health was issued to 534 vessels. It is usually taken by vessels bound for Indian, China, and East African ports, where quarantine restrictions are mild or are only put in force against arrivals from places where epidemics are actually prevailing. The total number of bills of health issued, including Form B., was, therefore, 1,176 against 1,162 in the year 1892 and 1,264 in 1891.

The remaining vessels, 36,304 in number, took no bill of health, as they were generally native coasting craft and Shepherd's ferry steamers.

The Bills of Health Form B. furnished to the vessels shown in above table were invariably clean bills, as at no time during the year did the Medical Board declare cholera to have been epidemic in Bombay. But attached to each bill of health was a certificate showing the number of cholera deaths in Bombay during the previous week. This necrological certificate can thus be withheld by ships captains unless demanded.

During the year, on inspection of outward vessels, only five cases of infectious disease were discovered and removed prior to sailing. These cases were chiefly of small-pox.

The sanitary condition of outward-bound vessels, excluding pilgrim ships, was, as a rule, fairly satisfactory, and a bill of health was in only one instance refused. Pilgrim vessels are excluded, because such vessels invariably cease to be in a satisfactory sanitary condition when their full complement of passengers has boarded them.

It will be seen that there were 13 cases of cholera (12 of whom died) and three cases of small-pox among a harbour population estimated at 22,142. These cases were treated in the Infectious Diseases Hospital. The vessels were thoroughly fumigated and disinfected. 128 persons were vaccinated on board of the small-pox affected vessels in the harbour. A noticeable feature in harbour cholera cases is the high ratio of deaths amongst those attacked, and this is especially marked in the case of native craft. The following table, which deals only with harbour boats lying about the various bandars, proves how high the mortality is.

Number of cases of and deaths from cholera on native boats, such as tonies, dingies, &c., during the last nine years :—

Year.	Cases.	Deaths.	Percentage of Deaths amongst those attacked.
1885 - - -	30	26	86
1886 - - -	2	2	100
1887 - - -	26	21	80
1888 - - -	15	10	66
1889 - - -	23	21	91
1890 - - -	3	2	66
1891 - - -	5	5	100
1892 - - -	12	12	100
1893 - - -	12	12	100
Total - -	128	111	86.

Another characteristic of native harbour boat cholera cases is the rapidity towards a fatal issue which marks the disease, from four to eight hours being generally returned as the duration of attack. These two points, however, were fully noticed in former reports, and need not be discussed in detail here.

Disinfection of Ships and General Health of the Shipping.—There were in all 34 vessels disinfected during the year—32 on account of infectious diseases among their officers, crews, and passengers, and the remaining two on account of glanders and farcy amongst horses. The disinfection, excluding two troopships which were disinfected by the Naval authorities, was carried out in a most satisfactory manner by the Water Police according to the instructions given by the Health Officer.

The general health of the harbour population was reported as good during the year. The St. George's Hospital admitted during that time 472 Europeans connected with the shipping and the harbour, of whom 19 died; whilst the Goculdass Tejpál admitted 251 Natives, of whom 12 died, and the Jamsetji Jijibhoy, 115 natives, of whom 11 died. The principal causes of admissions were due to accidents, malarial fevers, syphilis, rheumatism, bronchitis, venereal, chest, and bowel complaints. There were no cases of bilge poisoning reported during the year.

Quarantine.—During the year 1893 Suez did not impose quarantine against Bombay. No complaints were made by Captains and Shipping Agents of any delays, owing to quarantine regulations at foreign ports, caused to their steamers which left this port with bills of health during the year under review.

Red Sea Pilgrim Traffic.—The Hedjaz took place on the 23rd June, and was signalised by, perhaps, the severest epidemic of cholera on record. The total deaths cannot be given; but for some weeks they were stated to have been 1,000 a day; and so great was the number of decomposing bodies that the Turkish forces had to turn out to bury the dead; whilst such was the intensity of the stench that it was said to be recognisable in the Red Sea 60 miles off. As usual, India was given the credit of starting the epidemic, on what grounds it is not easy to understand, considering that cholera had for some time previously been endemic, and at times severely epidemic, in parts of the Red Sea coast, and that some of the villages in the French, Italian, and Somáli Settlements in the Red Sea had been almost depopulated by cholera the previous year.

According to the opinion of some of the medical officers of pilgrim vessels at Jeddah during the height of the epidemic this cholera scale was much exaggerated, as will be seen from the following extract from a pilgrim ship's diary: "This year's Haj was an "Akbari or Great Haz, the Haz day falling on a Friday. A much greater number of "pilgrims consequently gathered at Mecca. Scarcity of food and water was a natural "consequence. Bad food produced diarrhœa. Exposure to heat and dew made it "worse. People began to die from sheer starvation and exhaustion. The cry of "cholera was raised, and fear made matters still worse, killing people by hundreds "every day. There may have been cases of cholera, but all those who died at Mecca "and Jeddah did not die of cholera, although every death was attributed to it."

The "Knight of St. John," which is not a regular pilgrim ship, has been named as a possible cause of the cholera outbreak. This vessel is well known here, and has been inspected at least a score of times whilst trading between Bombay and Europe. Owing to her large size she was enabled to carry 1,013 adults on the nine superficial scale; but, as a matter of fact, she only embarked 1,007½. The depth of her first 'tween decks is 20 inches in excess of legal requirements, thus adding materially to the cubic space per passenger. She has been reported by Dr. Crimmin to have been, if anything, superior to the usual pilgrim liners, and to have been fitted in accordance with the requirements of the Red Sea pilgrim traffic. She left Bombay on the 28th April 1893 with a crew of 67 and 1,021 pilgrims (1,007½ adults), including children and infants, and arrived at Camaran on the 7th May, having had five deaths from ordinary causes during the voyage. The first undoubted case of cholera occurred amongst her pilgrims on the 15th May, whilst in lazaretto at Camaran, or 17 days after departure from Bombay. On these grounds only, as far as is known in this office, the vessel has been stated to have carried cholera into the Red Sea. Therefore, failing any deaths from cholera during the voyage or after arrival at Camaran until 15th May, and there is no evidence of any, the cholera poison, whatever be its nature, must have remained latent, and only become active 13 days or so after departure from Bombay, for the incubation of the disease is now considered to be within a period of four days at most.

Prominent notice was taken in last year's report of the danger to Europe from these periodical outbreaks of cholera at Mecca, and the injustice of invariably accusing India of originating them was pointed out.

Any one who has heard from ship captains and from pilgrims themselves accounts of the filth and absence of even elementary attempts at sanitation at Camaran, Jeddah, and the sacred cities, cannot but feel that so far from India being under existing circumstances a danger to Europe through the pilgrimage, she is herself, if the views on which quarantine is founded are to be accepted, in danger from Jeddah and Camaran. Such a view is not of course worthy of consideration, and all experience of the return of undoubted cholera ships to India from Jeddah shows that in spite of their crowded states and the insanitary habits of their passengers the disease dies out naturally during the voyage, and in no instance has the return of a cholera vessel caused an increase in the cholera death-rate of Bombay. Thus four pilgrim vessels had cholera cases during the voyage last year from Jeddah, but the disease disappeared before arrival here, and former Haz cholera years gave a similar result.

Camaran itself, in fact, so far from being a safeguard to Europe, is a danger; for Indian pilgrims perfectly free from cholera on arrival there almost immediately afterwards suffer from disease with gastro-intestinal symptoms caused by drinking the bracking water of Camaran and by the deficient sanitary arrangements of that place. They thus become very subject to the reception of the cholera poison, and on passing into an already affected area they become infected, and are then said to have originated the disease which they only incurred after landing in a cholera-tainted and most insanitary neighbourhood.

So much misapprehension seems to exist amongst the delegates of the Egyptian and Constantinople Boards of Health, as to the measures adopted in Bombay for the prevention of the export of cholera that the procedure adopted here for the inspection of pilgrims should once and for all be described.

Pilgrims for Jeddah are embarked in the Prince's Dock, and are allowed on board their vessel six hours before her departure. Having deposited their baggage on board, the males, with the exception of the very young, old and debiliated ones, are directed to leave the vessel, which is then moved away some 10 feet from the quay wall, the women being left on board. Those on board are then medically examined by the Port Health Officer, the ship's doctor assisting. The men are then passed in and examined one by one. A large staff of Custom House Officials, who are responsible that the number carried is not in excess of that laid down by law, *i.e.*, on the scale of 9 superficial and 54 cubic feet per adult passenger, and that the vessel is well found, &c., are present, as also a large staff of police and the Protector of Pilgrims with his staff. Under this system there is no chance of stowaways escaping detection as they sometimes used to when the embarkation took place in mid-harbour. In fact, since June 1884 no vessel, pilgrim or other, has sailed for Jeddah or any Red Sea port in possession of the Government Bill of Health without all its passengers having been inspected by the Port Health Officer before departure. It is difficult to see what additional precautions can be taken here to prevent the export of cholera, short of adopting the suggestion of Dr. Mackie, of the Egyptian Board of Health, that pilgrims should be kept before embarkation under observation here; and to this there are obvious objections.

The very valuable suggestions made by Dr. Crimmin in connection with those cholera outbursts at Mecca have been already brought to the notice of Government in last year's annual report, and in his letter concerning the "Knight of St. John" episode, No. 351, of 4th October 1893, and need not be repeated here.

Thirty steamers with 20,068 passengers (souls) left Bombay for Jeddah during the year, and were, with the exception of one outsider, "Knight of St. John," of the usual class engaged in the Red Sea Pilgrim trade. It is only right to add that this class has much improved of late years, and that the owners have, as a rule, carried out in a friendly spirit the suggestions made to them as regards the sanitary condition of their vessels.

The large increase in the number of pilgrims carried was due to the 1893 Hedjaz being an Akbar year, the big day falling on a Friday. An Akbar year should in the ordinary course of events take place once in 12 years, but has of late returned with a frequency not warranted by a strict adherence to arithmetical accuracy. This is said to be due to the fact that the Shareef of Mecca is presented with 1,000*l.* by a certain Mahomedan Prince on the occasion of an Akbar year.

The sanitary condition of these vessels has been reported to have been fairly satisfactory on inspection before their passengers boarded them, and to have ceased to be

so shortly after the embarkation of their pilgrims; and the ventilation is said to have improved, though still insufficient. This insufficiency of ventilation is of course due to the difficulty, in fact impossibility, of successfully ventilating by natural means a cubic space per head 'tween deck passengers of 54 cubic feet; the difficulty being increased by the fact that on all voyages, but especially on the return ones, the atmosphere of the 'tween decks is practically that of an overcrowded and very filthy hospital, owing to the large number of sick people, for whom there is no room in the permanent hospital, occupying it.

The principal sanitary defects in the pilgrim traffic, and the suggestions for their removal have been described in detail in former annual and special reports; and the subject generally was discussed in an Appendix attached to the report of the Native Passengers Ships' Commission of 1890. It is only necessary then to direct attention to two points not previously noticed in detail. These are:—

I.—The non-return of the diaries of certain pilgrim vessels which left Bombay during the year, and the consequent absence of any true history of the mortality amongst their passengers during the voyages to Jeddah.

II.—The fact that, irrespective of the using of a portion of the very small accommodation provided by law for each passenger by the enormous amount of pilgrims' baggage and from which they will not part, that area owing to the system of measurement of a vessel is often not available.

Non-return of Diaries.—The average number of pilgrims who left Bombay annually for Jeddah during the last nine years has been 12,400, so that Bombay must be considred the centre of departure of the Indian Section of the Red Sea Pilgrim traffic; and it is the Bombay authorities, therefore, who should receive the diaries of such vessels as embarked their passengers here. The law, however, only directs the medical officer of each pilgrim ship to keep one diary including a register of deaths and an admission and discharge book. At Jeddah this diary is to be handed to the Consular authority, and by him forwarded to the Government of India. The diary of the return voyage is to be handed to the Customs authority at port of arrival in India. Bombay is thus only entitled to the diaries of those voyages which end here, and has no claim on the diaries of such as begin here and end at Jeddah.

The Bombay Customs authorities furnish each vessel leaving Bombay with two copies of the diary for the outward voyage, one of which is returned to Bombay should the vessel come back; but there is no law compelling the medical officer to keep his diary in duplicate and send Bombay a copy.

Accordingly the diaries of the outward voyages of several Bombay vessels have not been received, and nothing whatever can be accurately known of the incidents of these voyages. A most important diary was that of the "Knight of St. John," already named as a so-called cholera ship; but it has not been returned to Bombay, and thus the authorities here have no reliable information as to the history of the ship after departure from Bombay. The importance of the diary must be admitted, and it is accordingly urged that a rule should be added to the Red Sea Pilgrim Act, that the Bombay authorities should receive a copy of the diary of any voyage to the Jeddah which began here.

The skimping of the Space provided by Law for each Passenger.—This arises as follows:—Pilgrims are of three classes, first, second, third. The two former are in cabins, the latter class in' tween decks.

The accommodation per cabin is gauged by the number of berths; but the floor space outside, such as the saloon, is measured at the regular rate of 9 superficial feet per head. Experience shows that rarely does a vessel carry its full complement of first and second class passengers, and as in measuring the ship the total available superficial area divided by 9 gives the number of passengers the vessel can carry, and no allowance is made for the fact that the first and second classes may be only half full, the third class or 'tween decks space gets even more passengers than it should; for the full number of tickets the vessel measures for is almost invariably issued. Thus a vessel with accommodation for 100 first and second class passengers and 800 third class, or a total of 900 may have only 50 cabin passengers, but she will almost certainly sail with 900 passengers; and 850 third class pilgrims are thus put in a space measured for only 800 and already encumbered by baggage. This state of affairs could easily be remedied by permitting the sale of only as many third class tickets as the 'tween decks really measures for, and checking the number by passing into the vessel each class separately.

Table showing the Number of Pilgrim Vessels with their Passengers which returned to Bombay from Jeddah viâ Aden during the year 1893:—

No.	Name of Vessel.	Date of Arrival in Bombay.	Tonnage (net).	Pilgrims.		Number of Deaths during Voyage.	Infectious Diseases and Number of Cases and Deaths of each.						Remarks.
							Cholera.		Small-pox.		Chicken-pox.		
				Embarked at Jeddah.	Disembarked at Bombay.		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
1	S.S. "Khiva" -	3rd April	1,452·39	273	257	6	—	—	—	—	—	—	
2	S.S. "Tanjore" -	15th July	1,402·64	937	922	15	6	5	7	—	—	—	
3	S.S. "Nasori" -	19th „	850·58	708	685	23	2	2	6	1	—	—	
4	S.S. "Naderi" -	20th „	1,168·92	355	129	*59	—	—	3	—	1	—	667 passengers landed at Karáchi. *13 deaths on board before leaving Jeddah. 45 deaths during voyage. 1 death occurred on arrival of the ship in Bombay.
5	S.S. "Venetia" -	24th July	1,550·58	919	283	36	13	13	1	—	—	—	600 passengers landed at Karáchi.
6	S.S. "Akbar" -	25th „	1,440·57	900	895	5	—	—	—	—	—	—	
7	S.S. "Huseinee" -	1st Aug.	993·82	749	741	8	—	—	—	—	—	—	
8	S.S. "Lombardi" -	25th „	1,570·80	940	231	14	—	—	1	1	—	—	695 pilgrims landed at Karáchi.
9	S.S. "Naderi" -	26th „	1,168·92	939	935	4	—	—	—	—	—	—	
10	S.S. "Naseri" -	4th Sept.	850·58	714	693	13	—	—	—	—	—	—	1 birth during voyage. 9 passengers landed at Aden.
11	S.S. "Tanjore" -	8th „	1,402·64	963	957	6	—	—	—	—	—	—	
12	S.S. "Huseinee" -	23rd „	993·82	768	766	2	*2	*1	—	—	—	—	*Choleraic diarrhœa.
13	S.S. "Mobile" -	24th Oct.	930·13	480	436	4	—	—	—	—	—	—	2 births during voyage. 42 landed at intermediate parts.
14	S.S. "Naseri" -	30th „	850·58	682	464	7	—	—	—	—	—	—	19 landed at Aden. 10 embarked at Aden for Bombay. 212 landed at Karáchi. 20 were taken from Karáchi.
15	S.S. "King Arthur"	3rd Dec.	1,047·49	463	429	4	—	—	—	—	—	—	30 passengers were landed at Aden.
16	S.S. "Naderi" -	5th „	1,168·92	176	182	1	—	—	—	—	—	—	6 landed and 13 embarked at Aden.
		Total -	18,843·38	11,466	9,015	207	23	21	18	2	1	—	2,290 pilgrims were landed at Aden and Karáchi. 43 embarked at Aden and Karáchi. 3 births during voyage.

Mortality on board Pilgrim Vessels.—The complete death-rate of the voyages to Jeddah cannot be given owing to the missing diaries already referred to; but including the "Knight of St. John," whose deaths are said by the Egyptian Board of Health to have been five, 27 out of the 30 vessels which sailed from Bombay had, amongst 18,361 passengers, 60 deaths, of which 20 were due to drowning during the burning of the "Khiva." Eliminating these 20 accidental cases, 40 deaths occurred amongst a population of 18,341.

The diaries of all the return voyages have been received, and the above table shows how excessive the mortality was. 11,466 pilgrims embarked at Jeddah in Bombay ships and had a mortality of 207 during voyages to this and intermediate ports. This equals a ratio of 18 per 1,000 per voyage or 469 per 1,000 per annum on the basis of a 14-day voyage. The death-rate on some of the early vessels is appalling, and is a measure of the destitution and sufferings of the unfortunates who did the Haz on an Akbar year and when cholera was rampant. It is also in part due to most of the voyages having been made during the S.W. monsoon; for, as pointed out in the Annual Report of 1890, foul weather voyages are twice as fatal to the pilgrims as fair weather ones. That safety valve of pilgrim ships—the upper deck—on which half the passengers remain by choice, thus doubling the available space per man in the 'tween deck, ceases to act, and the 'tween deck becomes congested by the rush of those whom stress of weather has compelled to seek its shelter. The mortality on several of these vessels was such that if the system of calculating an annual ratio of mortality from deaths occurring on voyages lasting 14 days is adopted, the result would be in the case of one of them—the "Naderi"—to wipe out all its passengers very nearly twice over, and in less marked cases to give results approaching the impossible.

The usual table showing the mortality on the return voyages since 1883 is appended. A fairer estimate of the danger to the pilgrim whilst on board his vessel could be formed from the statistics of the voyages to Jeddah, for at starting he is at his maximum of health, whilst on his return he is either at his minimum, and, therefore, very prone to succumb to the hardships of a voyage, or he represents the survival of

the fittest when nothing short of accident is likely to kill him. Statistics, however, of outward voyages are, for the reasons already given, unavailable.

Year.	Passengers who embarked at Jeddah or arrived at Bombay.	Number of Deaths during the Voyage.	Ratio of Deaths per 1,000 during Voyage.	Ratio of Deaths per 1,000 per annum on Basis of 14 Days' Voyage.
1883	7,656	45	5·9	153
1884	7,300	51	7·0	182
1885	4,904	57	11·6	301
1886	6,076	89	14·6	379
1887	5,726	64	11·2	291
1888	6,327	67	10·6	275
1889	10,031	92	9·17	238
1890	9,504	105	11·	287
1891	8,677	59	6·79	177
1892	11,944	101	8·45	220
1893	11,466	207	18·	469

The following table, which concludes the remarks on the Red Sea pilgrim traffic of 1893, has been kindly furnished by Her Majesty's Consul at Jeddah. It will be noticed that the departures of Eastern pilgrims from Jeddah fall short of the arrivals there by 13,076; and the Consul considers that three-fourths of those missing perished during the cholera epidemic. He also states that the sanitary inspector at Jeddah estimates that 80 per cent. of the Indian pilgrims are indigent, and although the Consul considers this an exaggeration, he doubts if it is as great an one as might be supposed.

List of the Arrivals at and Departures from Jeddah of Pilgrims from the East during the year 1893.

	Indians and Afghans.		Javanese and Malays.		Bokharians and Tártars.		Persians.		Total.	Difference missing.
	Viâ Suez.	Viâ Aden.	Viâ Suez.	Viâ Aden.	Viâ Suez.	Viâ Aden.	Viâ Suez.	Viâ Aden.		
Arrivals	5	14,796	—	13 856	1,086	5,050	449	2,195	37,437	13,076
Departures	—	11,381	—	8,895	232	3,023	406	424	24,361	

Sanitary state of the Harbour and Foreshore.—No works for the improvement of the sanitary state of the harbour and foreshore have been noted by Dr. Crimmin during the year; nor have the preventive officers stationed at the different bandars, and who see the conditions under the varying influences of high and low water, reported any. In some respects the general state must have deteriorated; for the bulk of the city nightsoil, without, it is believed, any previous notice whatever, was discharged during a period of several days into the harbour at Carnac Bandar; whilst Back Bay for a much longer time was fouled by the drain near the Pársi Gymkhána, which during repairs to the Queen's Road main drain poured forth the most offensive filth, the residents in the Marine Lines being the chief sufferers.

Since the insanitary state of the foreshore was first brought to notice in 1884 certain remedial measures have been adopted; and as a result a marked, if slow, improvement has, generally speaking, taken place.

ABSTRACT OF REPORT OF THE CALCUTTA MUNICIPALITY FOR 1893-94.

(Mr. J. G. Ritchie, Officiating Chairman.)

Town and Bustee Improvement.—In the miscellaneous Capital Budget of 1893-94, the Commissioners sanctioned two lacs for new drainage and bustee improvements of the town proper as required under section 37 clause (3) of the Act, and out of this sum one lac was appropriated for bustee and town improvements, there being no contribution on account of petty town improvements from revenue. The expenditure actually incurred and adjusted in the accounts has been Rs. 92,102.11.6, the amount spent on bustee improvement being Rs. 38,061.6.9, and on improvements in town, Rs. 54,041.4.9.

Bathing Platforms.—During the year, plans and estimates have been made to erect two bathing platforms, one in Moulvie Golam Sovan's Lane, and the other in Nazeer Nazibullah's Lane. The Commissioners considered these questions, and requested the Ward Commissioners to endeavour to get the land free of cost. Arrangements have been made to get land in Nazeer Nazibullah's Lane free of cost. These cases are pending. Possession of land has been received from the Land Acquisition Collector to erect a bathing platform in Maugpara Bustee, Ward No. 10. This work will be completed during the present year. The amounts spent and adjusted in completing the extension of the bathing platforms taken in hand last year, including petty repairs to the existing platforms, aggregate Rs. 4,329.4.6.

Waterworks.—The two new settling tanks at the Pulta Head Works have been completed, and are ready for use. The settling tanks into which water from the river Hooghly is first pumped have now a united working capacity of 105,000,000 of gallons, or five times the daily supply of filtered water. Severe erosions having taken place in the river bank, an estimate has been sanctioned for protective work amounting to Rs. 21,700 payable in 1894-95. The want of machinery stand-bye at the Tallah Pumping Station is expected to be supplied before the close of 1894. Contracts have been entered into with Messrs. Simpson & Co. of London for the supply of a pair of pumping engines of the Worthington type to deliver 22,000,000 gallons per day of 24 hours under a head of 100 feet on the rising main and, with Messrs. T. C. Mookerjee & Co. for the necessary engine-house and other masonry structures. The importance of these arrangements, as was mentioned in last year's report, consists in the fact that every gallon of filtered water supplied to Calcutta has to pass through the pumps at this station where the covered reservoir receives the supply by gravitation through the 48-inch and 42-inch cast-iron mains (about 12 miles long each) from the supply head at Pulta. Any accident to the machinery at this station, therefore, without the provision of this stand-bye, might result in very serious consequences to the population.

16·36 miles have been added to the distribution pipes, making their total length 302·09 miles. 1,479 premises have been connected, making their total 24,315.

Beginning with the first year of the amalgamation with the suburbs, the average daily supply of filtered water has been as follows :—

In the year 1889-90 it was 16,737,650 gallons.
In the year 1890-91 it was 17,180,665 gallons.
In the year 1891-92 it was 18,261,232 gallons.
In the year 1892-93 it was 20,030,535 gallons.
In the year 1893-94 it was 20,164,770 gallons

under report, which makes the average daily consumption per head to be approximately, 36·66 gallons for the "town proper," and 19·55 gallons for the "added area."

The expenditure for the year under all heads amounted to Rs. 10,97,347. After setting aside Rs. 96,566, including charges for interest and sinking fund, as the year's cost of the *unfiltered* supply, it is found that the *filtered* water has cost for the year

Rs. 10,00,781, which works out to 2·18 annas nearly per 1,000 gallons, and this, after 61·5 per cent. of the filtered water has been twice pumped. In addition to the town, an average daily supply was afforded to Barrackpore of 134,770 gallons, which is not included in the foregoing calculation of cost.

The *unfiltered* water supply is at present confined to the "town proper," but it will soon be required in the "added area" for all purposes for which it is in use. The average daily supply, inclusive of Hastings, has been as follows:—

In the year 1889–90 it was 3,159,541 gallons.
In the year 1890–91 it was 3,409,780 gallons.
In the year 1891–92 it was 3,889,673 gallons.
In the year 1892–93 it was 4,320,879 gallons.
In the year 1893–94 it was 4,298,975 gallons.

The length of pipes under the unfiltered system is now 72·46 miles, and there are connected with it 2,854 ground hydrants for watering roads, 254 sewer flushing chambers, 86 public bathing platforms, 148 public urinals, latrines and night-soil depôts, and 729 premises for flushing privies, &c. The consumption per head per day averaged 9·85 gallons. Taking the block to have cost 11 lacs, the cost of unfiltered water for the year amounted to Rs. 93,967, including interest and sinking fund, which works out to ·96 anna nearly per 1,000 gallons.

The Engineer is still engaged upon the projects of water supply for the riparian municipalities, that for Cossipore-Chitpore, which can be disposed of quite independently, is nearly out of hand. The rest still wait upon information not yet furnished by some of the municipalities concerned.

Under agreement, filtered water is now being supplied to the Manicktollah municipality by meter, at the rate of 4 annas per 1,000 gallons. The installation consists of service-pipes and standposts in the streets only. The Commissioners have sanctioned the supply to Cossipore-Chitpore up to a daily maximum of 350,000 gallons, at the rate of 4 annas per 1,000 gallons.

Drainage and General Construction.—The system of sewerage obtaining within the town proper is being extended to the suburban or added area as far as the conditions will allow. The Entally block has been under this treatment, and the works are approaching completion. This block is the nearest to the lowest point of the system, and it is proposed to extend the improvement for a certain fringe area along the Circular Road main sewers. At the same time improvements have continued to be introduced into the Calcutta sewers. Twenty-five flushing chambers have been constructed, raising their total to 383, and provision has been made in the yearly Loan Budget for other improvements. Rs. 13,112 have been expended in sewer repairs, which in all cases have carried important improvements with them. The sewers on the new system now measure 203·877 miles, and their capital cost, including suburbs, amount to Rs. 1,26,32,000, which sum includes Rs. 13,91,197 on improvements of roads for "main sewers." The number of premises connected with the sewers during the year was 437, bringing the total up to 27,997.

The Commissioners have appointed an Assistant Engineer with staff for working out the project for the drainage of the canal area, which is also to have combined with it arrangements for relieving certain areas in the north of town proper, which are subject to excessive and injurious flooding on the occurrence of heavy rain.

The preparation of a project at Kidderpore is also in hand, which will embrace arrangements for the disposal of the night-soil of a further suburban population.

The Engineer has submitted plans with two estimates, aggregating Rs. 11,23,958, for the surface drainage of that portion of the added area lying to the east of Lower Circular Road and Tolly's Nullah, and the Commissioners, on consideration, have referred the same to Mr. A. J. Hughes, C.I.E., M. Inst. C.E., for his opinion, including their bearing upon the general question of the drainage of the suburban area. The remainder of the added area, lying to the west of Tolly's Nullah, is also receiving attention, the first work being the providing all the existing drains with sluices at their outfalls. The largest of these sluices for the Chetla main drain has been completed, and is in operation at the present date.

Roads and Sewer Maintenance.—The length of public roads now measures 320½ miles, of which 100¼ miles are stone metalled, 161 miles brick metalled, 35½ are semi-brick metalled (over sewered ditches), and 24¾ miles remain kutcha or fair weather roads (all in the suburban area).

The length of sewers on the "New Drainage" system in charge of the Engineer's Department for administrative purposes, new amounts to 203·877 miles. For general inspection and cleansing purposes, the brick sewers were gone over 19 times during the year and the pipe sewers 57 times.

Vital Statistics of Calcutta.—The calendar year 1893 was one of heavy rainfall and high prices of food. As usual, birth registration shows sustained improvement. The birth-rate was 19·7 per 1,000, being the highest recorded birth-rate since the amalgamation. The ratio was especially high in the suburban area. The death-rate was 29·5 per 1,000, which is a little below the average of the previous four years. The following table gives the death-rate for the past five years :—

Death-rate per 1,000.

Year.	Town.	Suburbs.	Calcutta.	Year.	Town.	Suburbs.	Calcutta.
1889 - -	25	36·6	28·7	1892 - -	27·1	34·8	29·6
1890 - -	26·5	37·1	29·8	1893 - -	25·9	37·1	29·5
1891 - -	27·9	39·4	31·5				

In comparing the vital statistics of the town and the suburbs, it should always be remembered that all the deaths in the Campbell Hospital are included in the suburban statistics, although some inmates of that institution are drawn from all parts of the town. Out of 8,000 deaths registered in the suburbs, 995 occurred in the Campbell Hospital, and if these are excluded, the death-rate would be 31·5 only for the suburbs. This is only one of several special circumstances which have to be borne in mind, in order that the Calcutta vital statistics may be properly appreciated, and which were noted in para. 249 of last year's report.

As the ratio of mortality was higher in the suburbs than the average, the improvement was entirely in the death-rate of the town proper. Throughout Calcutta there was an exceptionally low mortality from cholera and small-pox, the number of deaths from cholera being the lowest on record. On the other hand, the mortality from fever was much above the average, and in the suburbs amounted to 3,342, the highest on record since the amalgamation.

Taking the mortality by wards, Ballygunge (42·8), the whole Canal Area north of Sealdah and Khidderpore (35·8) show the highest death-rates, with high rates of mortality from fever. The highest cholera death-rates were in Ballygunge (24·9), Added Area, Sukea's Street (21·2), and Puddopooker (20·4).

Vaccination.—The total number vaccinated during the year was 14,377 against 14,050 in 1892. There was an increase of 355 primary and decrease of 28 re-vaccinations. The ward registrars, as usual, gave notice of 10,884 persons, who failed to produce the statutory certificates of having had their children born within a year previously vaccinated, and these cases were inquired into by the Vaccination Department. There were 253 prosecutions against 247 in 1893. In addition, 1,000 notices were issued against 1,600 in 1892 to guardians of unprotected children.

ABSTRACT OF REPORT OF THE HEALTH OFFICER OF CALCUTTA FOR 1893.

(Dr. W. J. Simpson.)

Meteorology.

The variations in the atmospheric pressure for the greater part of the year was exceedingly small, the lowest reading 29·582 being recorded in July, and the highest 30 046 in December. As regards temperature, the mean daily value during the year was 76°·56, the mean maximum reading being 88°·55 and the mean minimum reading 63°·95; the mean daily variations were greatest from January to April and in December, whilst the temperature showed least variation in July. The lowness of temperature in January, February, and March was decidedly noticeable. The mean daily dew-point was highest in the month of August, and the mean maximum solar radiation attained the highest figure in April. The humidity of the air was generally higher than during the previous year. Rainfall was unusually heavy during the year, and was fairly distributed. Rain fell during all the months except December, the number of days which had rain amounting to 124. The five months, May to September, constituted the rainy season, with an average of 18 rainy days in a month. The maximum monthly total rainfall, as well as the maximum fall in 24 hours, were both extremely high, and both occurred in June.

Price of food.

The price of food was higher in 1893 than the average of the preceding nine years. Common rice sold on the average at Rs. 4-9-4 against Rs. 3-2-10 per maund. Fuel sold at a price lower than, and salt at the same price as the average of the previous nine years. The average price of meat, fruit, fish, and vegetables, was higher than the average of the nine years from 1884 to 1892.

Vital statistics.

The number of births recorded during the year 1893 was higher than that recorded during the previous four years. There were 13,492 births, giving an annual ratio of 19·7, which is higher than any recorded birth-rate since the amalgamation of the town and suburbs. The figures are as follows :—

Year.	Number of Births.	Birth Rate.
1889	12,317	18·0
1890	11,918	17·4
1891	12,477	18·3
1892	12,688	18·6
1893	13,492	19·7

The increase is mainly due to an improvement in the birth-rate of suburban Calcutta, though the town area also showed a decided improvement in this respect over the three previous years. As usual the greatest fertility was exhibited by the Christians and other classes, and by the Hindoos more than by the Mahomedans.

The number of deaths in 1893, exclusive of still-births, was lower than that of the previous three years, but higher than that of 1889. There were 20,113 deaths in 1893 against 20,180 in 1892, being a decrease of 67 deaths. The subjoined table gives the figures and ratios for the past five years :—

Year.	Number of Deaths.	Death Rate.
1889	19,564	28·7
1890	20,368	29·8
1891	21,157	31·5
1892	20,180	29·6
1893	20,113	29·5

The decline in the death-rate during 1893 was due mainly to an abnormally low mortality from cholera, the deaths from small-pox being small in number, and those from all other causes either remaining at nearly the same figures as in the previous years or being increased in number. Considered according to locality, the fall in the death-rate during 1893 was due to fewer deaths in urban Calcutta as compared with the previous year. The suburbs showed a decided increase in the death-rate over that of 1892. The following statement shows the deaths and death-rates in each of these divisions of Calcutta for the past five years :—

Year.	Urban Calcutta.		Suburban Calcutta.	
	Number of Deaths.	Ratio.	Number of Deaths.	Ratio.
1889	11,682	25·0	7,882	36·6
1890	12,382	26·5	7,986	37·1
1891	13,033	27·9	8,484	39·4
1892	12,674	27·1	7,506	34·8
1893	12,113	25·9	8,000	37·1

In *urban Calcutta* the decline in the death-rate was due to an exceptionally low mortality from cholera and small-pox. The number of deaths from cholera was 596, the lowest on record. The deaths from bowel complaints and other causes exceeded the decennial average, and the mortality from fevers during the year attained a higher figure than any recorded during the previous ten years. In *suburban Calcutta* the increase in the death-rate was due to an increase in mortality from fevers and other causes. From cholera the deaths recorded numbered only 273, the lowest since the amalgamation; and the deaths from small-pox were much below the average of the previous four years. The mortality from bowel complaints, though below the figures of 1889 and 1890, exceeded the average of four years by 105; and that from other causes, though below the number of 1889, was higher than the quadrennial average by 90. The deaths from fevers, however, amounted to 3,342, being the highest on record since the amalgamation. It will thus be observed that, while the town as a whole was freer from cholera than at any time on record, it suffered severely from fevers during 1893.

The birth-rate and mortality varied greatly in the different wards. It is worthy of notice that Burtola and Hastings are the only wards where the birth-rate exceeded the death-rate as in ordinary residential towns. In the northern portion of Calcutta, Jorabagan has a birth-rate of 10·1 and a death-rate of 29·4, whilst Burrabazar has a birth-rate of only 5·8 with a death-rate of 26·3. Compared to the previous year Jorabagan shows an increase both in its birth and death-rate, whilst in Burrabazar there is an increase in the birth-rate with a reduction in the death-rate, a certain portion of the improvement in the health of Burrabazar indicated by these results having taken place since the construction of the Harrison Road. In the southern portion of the town the greatest difference between the birth-rate and mortality is shown by Colootolah and Moocheeparah, and the least by Bamun Bustee, whilst Waterloo Street, which is the European business quarter, has a birth-rate of 6·7, with a death-rate of 12·4, the lowest in the whole town. The amalgamated area taken as a whole shows a high mortality, higher than the rest of Calcutta; and over a third of this mortality is observed to be due to fevers.

Fevers.

The deaths from fevers during 1893 attained a higher figure than in any year since the amalgamation of the suburbs with the town. There were 8,091 deaths in 1893, against 7,618 in 1892, 7,851 in 1891, 6,792 in 1890, and 5,994 in 1889. This increase in fevers occurred throughout the town, but was specially marked in the amalgamated area, as shown by the following figures :—

	1889.		1890.		1891.		1892.		1893.	
	Deaths.	Ratio.	Deaths.	Ratio.	Deaths.	Ratio.	Deaths.	Ratio.	Deaths.	Ratio.
Calcutta	5,994	8·7	6,792	9·9	7,851	11·5	7,613	11·1	8,091	11·8
Town area	3,341	7·1	4,154	8·8	4,675	10·0	4,632	9·9	4,749	10·1
Suburban area	2,653	12·3	2,638	12·2	3,176	14·7	2,986	13·8	3,342	15·5

From this table it will be observed that the fever mortality in *urban Calcutta* is steadily rising—a state of matters which demands most serious consideration. For several years past I have felt it my duty to point out the unsatisfactory condition of the drainage of urban Calcutta and its injurious effect on the public health. As a consequence of these representations Mr. Baldwin Latham, a sanitary engineer of eminence, was appointed to examine into the question, and his report clearly showed that radical defects existed in the drainage which must be remedied before any improvement can be expected. I would now urge that a commencement be made in the direction indicated by Mr. Baldwin Latham.

As regards the fever mortality in *suburban Calcutta*, the exceptional rains of 1894 contributed very largely to its production, combined with the condition of the existing surface drainage, and the want of proper drainage to carry away either storm or waste water. The subject has been the object of much attention during the year, a scheme having been devised and plans prepared.

On receipt of Mr. Baldwin Latham's report the Commissioners decided to engage the services of Mr. Hughes as a consultant to make a local inspection of the suburbs along with the municipal engineer, and to examine and report on the submitted plans. They also decided to forward the whole scheme as modified by the two engineers to Mr. Baldwin Latham. By this proceeding there will be every guarantee that the best system for the suburbs shall be adopted, and that no fundamental mistakes will be made at the commencement to be discovered as in the case of urban Calcutta after the drainage is completed.

Cholera.

The mortality from cholera during the year attained the lowest figure on record. The number of deaths was 869, against 2,019 in 1892, and against 2,292, the mean of the four years from 1889 to 1892. Both the urban and suburban portions of the town participated in this comparative freedom from cholera. The reduction in mortality from cholera does not appear to be due to any local cause, for a similar fall in death-rate marked the history of districts around Calcutta during 1893. Moreover, the fall in the cholera-rate was limited to the first two quarters of the year, the rest of the year showing but little change from the previous year :—

	1st Quarter.	2nd Quarter.	3rd Quarter.	4th Quarter.
1890	722	409	153	495
1891	1,750	412	183	610
1892	668	908	192	251
1893	158	258	184	269

The added area, however, considered apart from the town portion, showed a marked diminution in the death-rate from cholera throughout the year. This is made evident by the following figures :—

	1st Quarter.		2nd Quarter.		3rd Quarter.		4th Quarter.	
	Town.	Suburbs.	Town.	Suburbs.	Town.	Suburbs.	Town.	Suburbs.
1889	—	—	330	490	136	133	242	254
1890	456	266	177	232	75	78	255	240
1891	810	940	182	230	126	57	435	175
1892	420	248	569	339	109	83	159	92
1893	94	64	180	78	130	54	192	77

This shows that the improvement in the health of the suburbs with respect to cholera, consequent on the introduction of the water-supply that was noticed in the report for 1892, continued during the year 1893.

Small-pox.

The year 1893, like the one immediately preceding it, was a non-epidemic year for small-pox. With the exception of the outbreak among the sweepers on either side of the Circular Road in Ward No. 4, Sukea's Street, a few isolated cases only occurred in the town and amalgamated areas. Most of these were imported cases. The deaths numbered 31, against 21 in 1892.

Bowel complaints.

There were 2,882 deaths from diarrhœa and dysentery in 1893, against 2,364 in 1892. This is above the figure of every year since 1889, and exceeds the average of those years by 233.

Other causes.

The total number of deaths from all other causes was 8,240 against 8,158, being slightly above the average of the previous four years. The increase was entirely due to a large number of deaths occurring in suburban Calcutta, the deaths in urban Calcutta having slightly decreased from the average of the previous decade.

The two most important factors, which continue to exercise a deleterious effect on the health of Calcutta, are the condition of the drainage and the absence of a Building Act. I have already remarked on the former subject; and in each annual report I have drawn attention to the evils that arise from the latter, and the prospective evils that are likely to ensue, if no action be taken. Land is increasing yearly in value, and with no efficient law to control buildings or lay out streets, sanitary improvements in other directions are more than counterbalanced by the insanitary conditions, which are being continually created and perpetuated by the want of a Building Act.

Vaccination.

The total number vaccinated during the year 1893 amounted to 14,377. Of these, 12,636 were cases of primary vaccination, and 1,741 of re-vaccinations. The corresponding figures of the previous year were 12,281 and 1,769 respectively. This shows an increase of 355 of primary and decrease of 28 re-vaccinations. Of the 12,636 cases of primary vaccinations, 11,872 or 93·9 per cent. were successful, 568 or 4·4 per cent. were unsuccessful, and in 196 or 1·5 per cent. of cases, the result was not ascertained. In primary vaccinations the rate of success calculated on the ascertained cases was 95·4. Of the 1,741 cases of re-vaccination, 374 or 21·4 were successful, 1,136 or 65·2 per cent. were unsuccessful, and in 231 or 3·2 per cent. of cases, the result was not ascertained. The rate of success on ascertained cases in re-vaccination was 24·7. The rates of success on ascertained cases in 1892 were 96·93 and 26·80, respectively.

Of the total number vaccinated during the year, 7,775 were males and 6,602 females. According to nationality 615 were Christians, 9,667 Hindoos, 4,014 Mahomedans, and 81 other classes. 4,708 were under 1 year of age, 7,506 were 1 year and under 6 years, and 2,163 were 6 years and upwards.

Vaccination is carried on in Calcutta under the provisions of the Compulsory Vaccination Act. The Registrars of Births issue notices to parents and guardians of children at the time of registration to have the children vaccinated within one year. When a child is successfully vaccinated, a certificate to that effect is given to its parents, and the duplicate of it is sent to the Ward Registrar, who thereupon makes an entry in his birth register under the column "vaccination" to show that the child has been vaccinated. The Registrars submit to the Health Officer monthly statements of persons of whose children they do not receive certificates of successful vaccination within one year of birth. By such monthly statements they submitted during 1893 the names of 10,884 persons who failed to produce the statutory certificates of having had their children vaccinated. All these cases were inquired into by the vaccination department with the result that 5,874 were traced and vaccinated, 1,651 were found to have left town or changed abodes, 815 were not found at the addresses given, 809 had died, 1,397 were ill, 4 had small-pox, and 334 had to be prosecuted, the number actually prosecuted during 1893 being 253.

Under the powers conferred on the vaccinators by the amended Act, house-to-house inquiry for unprotected children was daily made by the male and female vaccinators in the town and amalgamated areas, and where children over one year were found, notices were issued by the department direct to parents or guardians to have them vaccinated within 15 days. In this way nearly 1,000 notices were issued during the year 1893. Most of the people served with notice got their children vaccinated, but 196 had to be prosecuted. In certain localities and among certain classes, such as the up-country Marwaries of Burra Bazar and Jorabagan, great difficulty is experienced in obtaining the names of parents, and hence these could not be adequately dealt with by law. Vaccination is making slow progress among these classes. Besides the above, 160 persons were prosecuted for neglect to bring vaccinated children for inspection; so that the total number of prosecutions under all heads amounted to 609 during 1893 against 618 during the preceding year. Vaccination is systematically carried on in all sections of the town and amalgamated areas. But the degree of protection in each ward varies with the character of its population. The wards inhabited by Europeans and resident Bengalees are generally better protected than those inhabited by up-country people. The Vaccination Act enables the vaccinators to push on vaccination amongst the lower classes of up-country men, but

the upper classes are very difficult to deal with, and vaccination is making very slow progress amongst them.

Laboratory Work.—During the year 1893, 50 samples of the Hooghly river water, as pumped into the settling tanks at Pulta, 50 samples of the same water after settling and 51 samples of Calcutta filtered hydrant water, were analysed, and the water supply of the city was found to have retained its usual purity. 151 samples of water from tanks and wells of Calcutta were examined, and 117 were found totally unfit for any domestic use, 99 samples of milk, 207 of ghee, 16 of butter, 22 of flour, 7 of barley meal, and 17 of arrowroot were examined; and 34 samples of milk, 228 of ghee, 1 of flour, 3 of barley meal, and 13 of arrowroot were found to be adulterated, and 12 samples of milk and 16 of ghee inferior in quality. 24 samples of miscellaneous articles were also analysed.

Conservancy.

For the removal of road and bustee refuse along with road-scrapings and horse-droppings of the town area, including the canal area, viz., the extended parts of wards 1, 3, 4, and 9, an average of 51 double and 360 single conservancy carts of the Gowkhanas worked with municipal animals, and 163 refuse carts, 17 horse-dropping carts, and 56 road-scraping carts hired with animals and men from contractors, were employed daily during the year 1893–94; the hired carts being common hackeries of the town to which refuse boxes had to be supplied at municipal expense in order to perform the work. For the removal of the road and bustee refuse, and horse-droppings of the suburban wards 19 to 22, 118 municipal single carts worked with municipal animals, and for that of the suburban wards 23 to 25, 72 refuse carts (including two for the incinerator) hired from contractors, but constructed on the municipal pattern, were employed daily during the same period. 25,574 waggon-loads of refuse and garbage were removed from the town and canal areas, and sent by the municipal railway to the dumping grounds at the Salt-water Lakes; and 142,062 cart-loads of refuse and garbage were removed from the suburban wards 19 to 25, of which 50,555 cart loads were burnt in the incinerator at Goragatcha, 6,598 cart loads were sent by railway to the Salt Lakes, and the rest were dumped on local lowlying lands used as refuse grounds. For the removal of small dead animals to Dhappa, 10 dome carts with covers were employed in the town, and five in the suburban area, all worked with Municipal animals.

An average of 49,030 privies not connected with the sewers, besides the free latrines in the amalgamated area, were served daily during the year 1893–94. Of these, 28,787 were in the town and canal areas, and 20,243 in the suburban area (wards 19 to 25). 2,129 mehters besides 3 night-soil carters, and 46 trenching coolies were employed to carry out this work. The removal of the pail contents of the privies was mainly carried on in wooden tarred buckets with covers, but in the suburban amalgamated area, 108 night-soil and sulliage carts were also employed with hired cattle and drivers. Besides, 12 carts were employed in the town, and 17 in the amalgamated suburbs with hired cattle and drivers, and 8 in the town with municipal animals and drivers for the removal of trade refuse (mostly cow dung). The sewage of the town and canal areas was discharged at 27 depôts into the sewers, and that of the suburbs was partly discharged at one discharge depôt into the sewers, but was in the main trenched in three trenching grounds.

During the year 1893–94, 97 foul tanks were under operation. Of these, 41 tanks were filled up and three cleansed and improved. Of the tanks under operation, in four the work was being done by the corporation; and of these last, only one was undertaken during 1893–94. Besides, 102 excavations and lowlands and 89 wells were obliterated, 65 cowsheds and cattle-sheds were improved, and 100 closed, 16 passages and courtyards were paved, 9,388 choked drains and pits were cleansed, 60 drainage spouts were repaired, 85 house surface drains were constructed, and 77 drains repaired during the year.

ABSTRACT OF REPORT OF THE MADRAS MUNICIPALITY FOR 1893-4.

(*Lieutenant-Colonel G. M. J. Moore, President.*)

Drainage.—Black Town Drainage.—The following works have been carried out during the year :—Constructing drains in Annah Pillay Street and Varadamoothiappen Street. Fixing 50 feet of 30″ piping on piles to discharge sewage from the outfall channel into the sea. Laying and joining 9″ stoneware pipes, 76 feet, to connect the same with sewer No. 2 manhole at the junction of Salay Vinayagar Covil Street and Broadway. A section of the old main drain at the site of the Law College now under construction, had to be cut out to permit of the foundation of the latter being put in, and for this purpose a length of 250 feet was removed and a diversion made by the Consulting Architect's Department.

A number of other drains were completed during the year.

Water Supply.—Owing to the large number of small street mains (branches) and the increasing numbers of private services, most of the public fountains at the north and south ends of Madras are cut off from a supply of water during the day. There is a large quantity of water pent up in the larger mains, and the Red Hills supply channel, which could be made available for the public if the smaller street mains were substituted by larger ones, and the system extended over the town to every important street and to every parcherry; and as it may take several years before a scheme for improving the quality of the water is undertaken, it appears desirable that the public should be given at least the water that is available, and for this purpose it is recommended that instead of disturbing much of the existing system, two auxiliary mains, each of 5 miles length, beginning with 18″ and terminating with 10″ iron pipes, be laid from the masonry shaft at Kilpauk, one through the 6th to the 8th Division and the other through the 4th to the 1st Division.

To check as far as possible all waste of water, meters are being fixed every year to places of business and gardens. The discharging orifices of all fountains have been reduced and restrictions placed as to the number and sizes of discharge cocks on all private services where meters are not fixed.

To enable those living in the localities, where there is no supply of water from the public fountains during the day, storage cisterns of 130 cubic feet capacity are built so as to enable them to procure at nights a supply of water, at least for drinking. Most of these cisterns, however, are emptied by 6 a.m. daily, and until their numbers are increased or the new mains laid, those living in the 1st, 4th, 6th, and 8th Divisions must continue to suffer for want of a proper water supply.

During the year under report, 12,350 yards of pipes were laid, and 81 fountains, 64 valves, 93 stop-cocks and 2 hydrants were fixed within the municipal limits.

On the 1st of April 1893 the level of the Red Hills Lake stood at 39·06, and on the 31st March 1894 at 40·55. On the 3rd August 1893, the level of the lake at Red Hills fell to 35·49, when pumping was commenced and continued until the 4th November 1893. The quantity of water supplied to the city during 1893–94 as compared with that for the previous year, was 330,488,478 cubic feet, against 326,856,762 cubic feet in 1892–93.

During the year 1,473 new services were laid by licensed plumbers, and 1,215 existing services were extended.

The rate of water supplied for non-domestic purposes has been four annas per 1,000 gallons throughout the year.

Vaccination.

The total number of cases vaccinated during the year 1893–94 was 23,644 against 24,858 in 1892–93, showing a decrease of 1,214 cases. The decrease was due to the small number of emigrant coolies and jail convicts operated on during the year. In the jail there was a decrease of 86 cases and in the Natal Emigration Depôt 959 cases, thus making a total of 1,045. The remaining decrease of 167 cases was among children brought to depôts for inspection and found unfit to be operated on owing to their illness. In 1,181 cases vaccination had to be postponed, or in 213 cases more than the last year. Out of 23,644 cases 22,239 were successful, 468 unsuccessful and

937 unknown. The unsuccessful and unknown results were greater than those of 1892–93 by 264 and 582 respectively. The large number of unsuccessful cases is attributed to the fact that some of the convicts have been operated on over and over on admission into the jail, under the provisions of the Jail Code, para. 734,—"Every "prisoner received into jail, whether under sentence, detained on requisition of security, "or committed for trial, shall be vaccinated on admission, or as soon afterwards "as possible, without reference to his own wishes."

The following statement shows the vaccinations performed in 1893–94 as compared with 1892–93. 2,192 emigrant coolies were vaccinated in the Natal Depôt by sending out calves to them as requested by the emigration agent as against 3,151 coolies in 1892–93. Calves were also sent to the Penitentiary thrice a week instead of twice as was done last year, and all convicts, including those sentenced to from 3 to 5 days, were operated on by the municipal vaccinators. The Deputy Inspector of Vaccination inspected the results of vaccination done among the emigration coolies of the Natal Depôt and convicts of the Penitentiary. The weekly visits to the latter were paid every Thursday, when all the convicts were paraded for the inspection of the police. The results of those convicts undergoing short terms of imprisonment of from three to five days were not ascertained, as they were released before inspection. 2,106 convicts were vaccinated during 1893–94 against 2,192 in 1892–93.

Year.	Total vaccinated.	Compared with the preceding Year.		Successfully vaccinated.	Percentage of success, excluding unknown.
		Increase.	Decrease.		
1892–93 - -	24,858	—	1,635	24,299	99·16
1893–94 - -	23,644	—	1,214	22,239	97·93

The percentage of primary and re-vaccination successful cases, excluding the unknown results from the total, was 97·93 against 99·16 in 1892–93, showing a decrease of 1·23 per cent. due to the unsuccessful results obtained by re-vaccination of jail convicts as explained above. The tri-weekly system of vaccination introduced in 1889–90 in the several vaccination depôts compares favourably with the daily vaccination of the previous years.

There are eight depôts where vaccination is carried on thrice a week and free of any charge. The fishermen in the Cassemode Cooppam, &c., resort to the Tondiarpet Vaccination Depôt, which is nearer than the one in Monegar Choultry. Calves are inoculated in the Central Depôt, Chintadripet, and are taken to the other depôts on the working days, and the children brought for vaccination are operated on from calf to arm. Inoculated calves, or lymph in tubes, are sent out to those people who apply for vaccination at their own houses, as desired by them, and during the year 70 calves and 528 tubes were sent to private houses. During 1893–94, 41 calves were sent to the Natal Emigration Depôt to vaccinate the coolies, and 132 calves to Her Majesty's Penitentiary to vaccinate the jail convicts. The civil prisoners of the Debtors' Jail are sent to the Monegar Choultry Depôt, which is very close to it.

Out of 23,644 cases operated on, 13,693 were males and 9,951 femals; 941 were Europeans, East Indians, and Native Christians, 1,773 Mahomedans, 20,929 Hindus and one other caste.

The number of infantile vaccinations performed during the year was 13,343 against 13,849 in 1892–93, showing a decrease of 506 cases. Of these 13,194, or 99·71, were successful.

The following statement will show the number of cases vaccinated during the past three years under different ages :—

	Total Number Vaccinated.			Ratio.		
	1891–92.	1892–93.	1893–94.	1891–92.	1892–93.	1893–94
Under one year - - -	15,903	13,849	13,343	60·0	55·7	56·4
Above one and under six years -	4,682	4,841	5,021	17·7	19·5	21·3
Above six years - - -	5,908	6,168	5,280	22·3	24·8	22·3
Total - - -	26,493	24,858	23,644	100·0	100·0	100·0

The number of births registered and the number of infants vaccinated under one year, as compared with the two preceding years, is given in the following table:—

Year.	Total Births registered, including still-born.	Still-born.	Deaths under One Year, exclusive of Still-births.	Born alive.	Number Vaccinated under One Year.	Percentage of Vaccination to Births.
1891–92 - - -	18,798	462	6,676	18,336	15,903	86·73
1892–93 - - -	17,249	460	4,921	16,789	13,849	82·48
1893–94 - - -	18,752	459	5,494	18,293	13,343	71·15

The number of births registered, including those that occurred in hospitals and dispensaries, was 18,572. Of these 459 were still-born and 18,293 were born alive. Exclusive of still-births there were 5,494 deaths under one year from various causes. If 5,953 deaths be deducted from the total births registered, the number of live children left for vaccination was 12,799. The infants vaccinated during 1893–94 were 13,343, showing an excess of 544. 2,777 births reported in hospitals and dispensaries were not traced by the Department for vaccination, as the details sent by the medical officers in charge were not sufficient to find out their whereabouts after the age of six months. All infants operated on were not born in Madras, but some of them were born up-country, where mothers were taken temporarily for confinement, and brought to Madras after delivery. In a large number of cases children born in the Mofussil were brought to Madras and vaccinated after residing within the City for two months under Byelaw 8.

Out of 13,343 infants operated on under one year, 3,666 are said to have been born beyond the municipal limits and 9,677 in Madras.

For every 100 of the population according to the Census of 1891, 5·22 were vaccinated during the year. The proportion of Hindus is especially large, and 5·83 per cent. of this class were vaccinated against 2·36 among Europeans, East Indians and Native Christians, 3·53 among Mahomedans, and 0·17 among other castes.

During the official year 1893–94, 24 deaths from small-pox occurred against 21 in 1892–93, showing a slight increase of three cases in the mortality. Out of 24 cases three were reported in hospitals and dispensaries and 21 in private houses within the city. Of the deaths four occurred under the age of six months, four above six months and under one year, nine under 12 years, and seven over 12 years. Excluding the deaths in hospitals, six out of 21 were imported cases of small-pox, the parents having come up to Madras with their children after contracting the disease in the Mofussil. Unless it is proved under Byelaw 8 that parents or guardians of children not born in Madras but beyond the municipal limits have resided within the city for 60 days, they cannot be served with notices for vaccination, and those above 12 years cannot be compelled, for a child under the byelaws is defined "a boy under 12 years of age or a "girl under 10 years."

Small-pox was not confined to any particular locality, the cases occurring sporadically. Immediate measures were always taken to stamp out the disease by vaccinating the unprotected children in the neighbourhood where deaths occurred, and in disinfecting the houses in which the disease broke out. Re-vaccination of adults residing in the infected houses as well as in the vicinity was also encouraged. In the case of persons who are exposed to the contagion through residence in a house infected with small-pox, a special provision in the byelaws is very desirable for the compulsory vaccination of infants under six months and the re-vaccination of those above 12 years of age.

The number of calves inoculated during the year was 628 against 630 in 1892–93. Out of this number 13 calves did not take after operation but totally failed, even if the operation was repeated a second time from calf to calf. Six died, two before operation and four a month after. No contractor has been found who will undertake the supply of calves required for the municipality, although the rate allowed is liberal. The supply of calves required for the maintenance of animal vaccination in Madras is managed departmentally, and calves from one to three years old are obtained for the purpose. When the demand for the supply of glycerine vaccine paste from district boards and municipalities is excessive, it is difficult to obtain a sufficient number of calves. The ryots strongly object to the process of scarification, which is necessary for the preparation of glycerine paste, on the ground that the skin is damaged and

that the health of the calves after removing the pulp is deteriorated. The calf lymph in use was found to deteriorate in quality in January 1894. Steps were taken to renovate it by inoculating a donkey with calf lymph as well as with lymph from the human subject.

Births.—The births registered during the year 1893 numbered 18,221, exclusive of still-births, being 1,562 more than the previous year and the highest number recorded, the ratio per 1,000 of the population according to the Census of 1891 being 40·2 to 1,000 persons living. The number of still-births was 483, being 2·1 still-births to 100 survivals. The male live-births numbered 9,328 and the female 8,893, the proportion being 104·8 to 100, and the male still-births were 260 and the female 223, the proportion being 116 to 100. Vital Statistics.

The Mahomedans were the most prolific, their birth-rate being 41·7. The Hindus, who usually occupy the first place, came second with a ratio of 40·5, and the Christians third with 35·9. Amongst the Christians there was a slight excess of female over male births.

The births were by no means evenly distributed over the wards, the 5th Division, South Ward, and 8th Division, North Ward, having the highest ratios of 55·2 and 48·0, and the 3rd Division, South Ward, the lowest 25·6, the difference between the highest and lowest ratios being 29·6.

Mortality.—The deaths registered during the year numbered 18,584, against 20,847 in 1892 and 23,808 in 1891, being in the proportion of 41 per 1,000 against 46 and 52, the mean of the decade being 38·9. Although a marked improvement is shown on the two previous years, the death-rate is still above the mean and is abnormally high from preventible diseases, showing the urgent need for sanitary works. The fact that the mortality for the last few years has been considerably higher than the decennial mean, is directly attributable to the high price of food. In this country high prices affect a town population much more than a rural one, as the former receive a money wage for their labour, whereas the latter are, as a rule, paid in grain, the amount of which does not generally vary with the price, so that so long as they can get work, which, however, they are unable to do in times of severe drought, they are better fed than the town labourers. So long, therefore, as the present high prices prevail, unless an adjustment of wages is made, a high rate of mortality in the city must be expected to continue.

Mortality from different Diseases.—A comparison of the relative mortality from different diseases in 1892 and 1893 (see table below) shows that the deaths registered under small-pox, fevers, dysentery and diarrhœa, cholera, and other causes were fewer in the year under review, and those under measles more numerous than in the preceding year. The deaths under small-pox, dysentery and diarrhœa, cholera, and other causes were also below the decennial average. The mortality from fevers was still very high, whilst that from cholera was exceptionally low. Measles was epidemic during the first half year, the mortality being highest in March, April, and May.

Statement of Mortality from the Prevalent Diseases in 1893 *contrasted with that of* 1892.

Years.	Small-pox.	Measles.	Fevers.	Dysentery and Diarrhœa.	Cholera.	Total.	Other Causes.	General Total.	Ratio per 1,000.
1892 - - -	27	374	6,889	3,958	611	11,859	8,988	20,847	46·0
1893 - -	20	879	6,628	2,708	27	10,262	8,322	18,584	41·0
Average of 10 previous years.	631·3	307·2	4,441·3	2,995·8	607·6	8,993·2	8,626·3	17,619·5	38·9

Out of a total mortality of 18,584, 9,020 males died and 9,564 females, giving the proportion of 94·3 to 100. The deaths according to caste were, Christians 1,341, Hindus 14,990, Mahomedan 2,246, and others 7, the ratios per 1,000 being Christians 33·7, Hindus 41·7, Mahomedans 42·2, and and others 11·7.

Small-pox.—Vaccination has now been compulsory in Madras for 10 years, and during that period small-pox has never been epidemic in the town, the highest mortality from it registered in any one year being 78. In the year under review 20 deaths occurred.

Cholera.—Perhaps the most satisfactory feature of the year's statistics is that cholera was never epidemic, the total mortality from the disease only amounting to 27, the lowest number of deaths in the decade with the exception of the year 1886.

Measles.—This disease caused an exceptionally high mortality during the first half year, during which it may be considered to have been epidemic in the town. Ever since the year 1889 it has made a heavy contribution to the general mortality. Making all allowance for its epidemicity and virulent character, the high mortality indicates that the cases are neglected, for, if proper care is taken to prevent secondary affections of the respiratory organs, very few cases should end fatally. So long as the cases are not sent to hospital or notified to the municipality, it would appear that nothing can be done to reduce a mortality that should be to a great extent preventible.

Fevers.—The deaths from fevers numbered 6,628, or 14·6 per 1,000, against 6,889, or 15·2 per 1,000 in the preceding year. The mortality was highest in the 3rd Division, Centre Ward, which had a ratio of 22·1 per 1,000, and lowest in 6th Division, North Ward, 8·1 per 1,000. The fever mortality was much above the decennial mean throughout the year and was highest during the months of August and September. The general conditions which produce a heavy mortality from fevers in Madras are the general insanitary conditions which prevail, specially those due to the want of good drainage and pure air. The result is materially affected by the want of ventilation and overcrowding of houses, in which the people breathe air vitiated by organic matter given off by the lungs and skin, mingled with which are the gases from the sewage polluted ground and from the drains both inside and in the streets beneath the door and windows. If they sleep outside, chill, due to want of proper covering to protect them from the wind and dew, is no doubt an exciting cause. Such causes lead to people being attacked by the febrile diseases classed under the general head of fevers, but the fatal result that follows in so large a proportion of the cases is no doubt in a large measure due to the want of rational medical treatment, good nursing and a suitable diet. During the last few years the mortality from fevers has shown a marked increase, not only in Madras but also in the other Presidency towns, and the principal cause of this is the scarcity and consequent high price of food that has prevailed, the connexion of which with Indian fevers has been clearly shown. In Madras the rise in the fever mortality commenced in 1889, the year in which the rise in the price of food commenced after the Ganjam famine, and reached its maximum in 1892, when the price of food also reached its maximum. Both remained very high in 1893, though a slight fall occurred. In the words of Sir William Moore, "the bulk "of the people must have more food, better dwellings, and more suitable clothing, "before we can hope for a material reduction in Indian fevers."

Bowel complaints.—The deaths from dysentery and diarrhœa numbered 2,708 against 3,958 in the preceding year, being 1,863 from the former and 845 from the latter, which give the ratios of 4·1 and 1·8 per 1,000 respectively, or 5·9 for the two together. Dysentery was most severe in the 1st Division, Centre and West Wards, and diarrhœa in the 5th Division.

ABSTRACT OF REPORT OF THE MUNICIPAL COMMISSIONER FOR THE CITY OF BOMBAY FOR 1893-94.

(*Mr. H. A. Acworth.*)

SPECIAL DRAINAGE.—For the purpose of carrying out the several large works of special drainage, Mr. James W. Smith, M.I.C.E., the Drainage Engineer of the municipality of Bombay, was appointed to be in charge of the works under the designation of special Drainage Engineer with effect from the 1st March 1893.

The works in progress during the year under review were the following :—

Colaba Sewerage Works.
Umarkhadi Sewerage Works.
Connaught Road and Sussex Road Drainage and Sewerage Works.

Colaba Sewerage Works.—The estimated cost of these works was Rs. 7,09,608 and they are being constructed on the Shone system, and as this is the first introduction of this system into Bombay, its practical working will be noted with care and with interest.

Umarkhadi Sewerage Works.—The estimated cost of these works was Rs. 3,47,464. The tender of Messrs. Bulkley & Co. viz. Rs. 2,48,873 was accepted. The contract was signed on the 7th February 1894, and work commenced the following day, and is now in progress.

Connaught Road and Sussex Road Drainage and Sewerage Works.—These works were estimated to cost Rs. 51,916. The tender of Messrs. Mistri, Bhedwar, Vachaghandi and Co., amounting to Rs. 30,577 was accepted. The contract was signed on the 26th September 1893, and the order to commence work given on the following day. The work was practically completed within the contract period of 5 months, some minor defects only remaining then to be remedied.

DRAINAGE.—*Pumping Station, Love Grove, Warli.*—This most urgent work was happily accomplished well within the contract time. The work was commenced on the 6th March 1893. Engine No. 1 was started to work on the 8th June, nearly two months under contract time. Engine No. 2 was started to work on the 11th June, and Nos. 3 and 4 on the 16th June.

House Connections in First Drainage Section.—The House Connection Committee of the Corporation not having completed their report, the works are practically at a standstill. Experiments with various modes and systems of house connections are being tried, but the experimental stage has not yet been passed.

Miscellaneous Works.—Certain small works of drainage in Girgam and on Queen's Road are approaching completion. The brick arching over the old open main drain at the Arthur Road crossing was completed on the 5th January 1894, at a total outlay of Rs. 15,321-2-4, including all charges. The sewerage works in Parel District, consisting of a cast iron pipe sewer and ventilating shafts were divided into two parts, the first of which was completed on the 7th June 1893; the second part was finished eight months after the contract time. The total cost of the work, inclusive of all charges, amounted to Rs. 43,275-7-8. The work in Haines Road at the Stormwater Reservoir consisted of making and pitching the boundary slopes of the reservoir, and was completed on the 12th September 1893. The contract time was extended two months in consequence of delay in giving the order to commence work and the difficulty of obtaining earth during the wet season. The outlay on the work, including all charges, was Rs. 1,199-6-4.

The works for providing storm-water drains at Dadar Road, Sleater Road, Chikalwadi, the Crescent opposite the Old Municipal Building and Clive Road, were virtually completed on the 22nd September 1893, some minor defects remaining to be remedied by the contractors.

The drainage sluices have worked satisfactorily under the care of the usual staff.

Several additional latrines and urinals have been constructed where most required, and ground has been acquired on which to erect others. In some cases the work has been deferred in order to consider objections raised against the sites chosen.

WATERWORKS.—*Tansa.*—The rainfall for the year was 116·32 inches. The heaviest fall of rain in one day occurred on the 18th of June 1893, when 8·53 inches were registered. The lowest water level was 396·27 registered on the 27th May. The lake overflowed on the 20th June after 31·85 inches of rain had been registered. The overflow ceased on the 22nd September. The quantity of surplus water which passed over the weir is estimated at 31,548 millions of gallons. The quantity withdrawn by the duct was approximately 7,400 millions of gallons during the year, of which about 890 were passed into the Vehar Lake and the remainder brought to the City. The The dam continues in a satisfactory state. Additional works were sanctioned by the Corporation, and are being carried out partly by contract and partly departmentally; it is expected that the whole will be completed by the end of 1894. The supply of water was stopped for one week from the 24th September 1893, to admit of the annual examination and repairs to the duct. The total time of stoppage of Tansa water during the year was 14 days and 2 hours. Five bursts occurred at different places on the 48-inch main, but were speedily repaired.

Vehar Lake.—The registered rainfall at this lake was 82·07, this being about 2·2 per cent. below the average. On the 7th August the lake overflowed and ceased to do so on the 30th September. The heaviest rainfall during the season was on the 7th August, and was registered at 5·77 inches. During the dry season the daily loss of water between the 31st October 1892 and the 31st May 1893 was 13·09 millions of gallons per day; formerly this reached about 18 millions of gallons, but has become reduced partly in consequence of surplus water being brought from Tansa Lake, and partly on account of reduced demand for the City of Bombay, Tansa Lake having become a source of supply. It is estimated that Tulsi Lake has, by overflowing into Vehar, added 370 millions of gallons. A 42-inch flanged pipe in the Vehar outlet tunnel failed on the 30th August 1893, causing some damage, but was repaired in due course, and in the interim, water from Pawai Lake was supplied to the City of Bombay. It is under contemplation to effect some structural changes to the outlet arrangements of both Vehar and Tulsi Lakes. A burst in the Vehar 32-inch main occurred at Kurla, which was remedied with as little delay as possible.

Tulsi.—The rainfall was 94·07 inches. The heaviest daily fall of rain occurred on the 7th August, and was registered at 6·37 inches. The lowest water level was 436·60. The lake overflowed on the 9th August, and ceased on the 23rd September. It is estimated that the quantity of water which passed over the waste weir into Vehar valley was 370 millions of gallons. The management of the forest has been entrusted to the Forest Department of Government with the approval of the Corporation, Repairs to the embankment carrying the Tulsi water main between Haines Road and Mahim Mori Road have been effected by contract at a final cost of Rs. 11,235-1-0. Sanction of the Standing Committee was accorded for the repair by contract of the embankment near Bandora, and it is expected that the work will be completed by the end of 1894.

Pawai.—The supply from this lake was not required except during the period the repairs were being carried on in connection with the burst of Vehar pipe main. The Pawai lake overflowed on the 23rd June, and continued doing so until the 9th October. The total rainfall was registered at 89·84 inches.

Malabar Hill Reservoir.—It is estimated that the leakage from the distributing basin and vaults of this reservoir amounted during the year to about 120,000 gallons per day, when the depth of water in the basin was 17 feet 6 inches. The repairs of the floor of vaults and distributing basin with Indian Patent Stone has been sanctioned, but the work in the basin has been deferred pending the result of a proposal to construct more sand filters.

Bhandarwada Reservoir.—After completion of repairs to the distributing basin of this reservoir, filtration was resumed on the 21st December 1893 with satisfactory results. During the rains the floor of the basin was forced up in two places by water pressure under the ground; remedial measures have been adopted, which will, it is expected, modify the danger of this recurring, but the ground water from the hill above will, it is feared, always be a possible cause of trouble.

The offer of rewards for the capture of crocodiles in the lakes and the finding of their eggs was continued, and resulted in claims for four crocodiles and 64 eggs. It is satisfactory to know that no complaints have been made during the year of leeches having been discovered in the water supplied, and it is most likely that the source of those found in former years was in the drains.

Distribution and Maintenance.—Sanction of the Corporation having been given to connect the Tansa 48-inch main with the Vehar 32-inch main at Chinchpokli, progress has been made with the work, but operations have been suspended until the settlement of a controversy with the G. I. P. Railway Company. In the budget of 1893–94, the sum of Rs. 30,000 was provided for the extension of water mains. Some portions of the work have been done departmentally. The closing of dipping wells and substitution of supply from taps is still going on. A well in Upper Colaba is to have a fountain substituted for it by Government, with the approval of the Corporation and Sir Jamsetji Jijibhoy, Baronet, who is heir to the donor. The Ratansi Mulji fountain and cattle trough at the junction of Mint and Frere Roads was opened by the Honourable Mr. H. M. Birdwood, C. S. I., on the 8th January 1894, and handed over to the municipality. The fountain was presented by Mr. Ratansi Mulji. The total number of notices issued to owners on account of faulty taps and service pipes, &c., was 5,055 against 3,906 in 1892–93. The Standing Committee sanctioned the severance of service connections for various reasons, in 812 instances, 158 of which were carried into execution. Throughout the year 187 bursts of water mains and pipes occurred, all of which were promptly repaired. The total number of free supplies such as dipping wells, drinking fountains, &c., distributed over Bombay is 194. During the year, 633 new service connections were made, and 263 were severed on account of buildings demolished, contraventions of the Municipal Act, &c. The net increase of connections being 370, which brings the total up to 18,856, or 2 per cent. increase. The number of meters in use on the 31st March 1894 was 1,562, against 1,426 in the preceding year, being an increase of 136. The registered consumption through meter for the year was about 1,081 millions of gallons, or three millions of gallons per day.

Sanction has been accorded by the Corporation for the supply of water to the Kurla municipality, for a period of five years, at the rate of 12 annas per 1,000 gallons. A similar agreement is in force with the Bandora municipality for a term of five years from the year 1892.

Disposal of Refuse.—After several systems of disposing by incineration of refuse had been discussed and tried, it was decided to practically examine the merits of the Garlick Incinerator. Accordingly three furnaces were erected in the enclosure of the municipal workshops, and burning operations commenced on the 19th August 1893, and the result at the close of the year was found to be satisfactory.

Public health.

The state of the public health during the year under review was more favourable than in the previous year, the mortality being 3,376 less than in 1892. The total number of deaths from all causes amounted to 23,142, equal to a death-rate of 28·16 per 1,000 of population calculated on a population of 821,764 (census of 1891). The average number of deaths for the previous five years amounted to 23,484, or a death-rate of 28·10 per 1,000 of population. The returns of mortality show a decrease in almost all the death causes. It will be observed that there is an increase of 61 in deaths from "accidents."

The sections of highest mortality were 2nd Nagpada, 47·10; Parel, 39·07; Kamatipura, 38·69; Khara Talao, 37·28; Tardeo, 37·03; Chukla, 36·02; Mandvi, 35·98; Oomerkhari, 34·02; and 1st Nagpada, 32·15; and the sections of lowest mortality were the Water Division, 3·29; Fort (South) 4·04; Mahalakshmi, 13·28; Chawpati, 13·63; Walkeshwar, 14·08; Worli, 15·49; Esplanade, 15·89; Tarwadi, 18·45; Fanaswadi, 19·73 per 1,000 of population. The death-rate was highest amongst Negro-Africans, Lingayets, Hindu low castes, Jains, Bhatias, and Mussulmans, being 589·04, 49·74, 43·25, 40·43, 37·51, and 37·23 per 1,000 of population respectively, and lowest amongst Jews, Europeans, Buddhists, and Parsis, being 2·31, 18·68, 21·05, and 22·27 respectively.

Cholera.—The number of deaths from cholera was 147, or 22 less than in the previous year, and 11 less than the average. The sections of greatest mortality were the Esplanade, Water Division, Dhobitalao, Byculla, Oomekhari, and Fort (South). The highest mortality by class was amongst Hindu low caste, Jews, and Hindus of other castes.

Small-pox.—The deaths from small-pox were 201, or 340 less than in the previous year and 116 less than the average. They occurred chiefly amongst Negro-Africans, Native Christians, and Hindu low-castes. The mortality was highest in Sion, 2nd Nagpada, Mahim, Tardeo, and 1st Nagpada.

Measles.—There were 289 deaths from measles, or 421 less than in the previous year; 224, or 77·50 per cent., of them occurred in the first three years of life. The highest mortality occurred amongst Hindu low-castes, Brahmins, and Bhatias. The death-rate was highest in the districts of 1st Nagpada, Mazagaon, Sion, and Parel. In Upper Colaba, Fort (South), Esplanade, and the Water Division there were no deaths.

Fever.—There were 5,844 deaths from fevers, or 1,907 less than last year, and 1,153 less than the average. As usual, fevers contributed largely to the mortality. The death-rate was highest in the districts of Mandvi, Parel, Chukla and Sewri. The greatest mortality (excluding the small population, 146, of Negro-Africans) was amongst Jains, Lingayets, Hindu low-castes, and Buddhists.

Leprosy.—There were 51 deaths from leprosy, or 6 more than in the previous year, but 13 less than the average.

The number of births registered (exclusive of still-born) was 15,218, or 267 less than last year. Of these, 7,875 were males and 7,343 females. Excluding Negro-Africans, the birth-rate was highest amongst Hindu low-castes, Parsis, Eurasians, and Jews, and lowest amongst Brahmins and Lingayets. The sections giving the highest birth-rate were Tardeo, Parel, Mahim, Kamathipura, and Dhobi Talao.

Conservancy.—On an average 4337·94 men and women and 1,084 scavenging and drain carts, and 202 night-soil and cesspool carts were at work each day. 315,251 tons of garbage, equal to 864 tons a day, were collected, removed, and disposed of, against 318,194 tons in 1892; 138,297 tons of night-soil, equal to 378·8 tons a day, were collected and removed, against 140,480 tons in 1892; 195·4 miles of covered drains were opened and cleaned, against 182·8 in the previous year. There were four horses and 2,261 bullocks owned by the municipality, and of these latter 153 died and 76 were cast and sent to Pinjrapole.

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC

ABSTRACT OF REPORT OF THE HEALTH OFFICER OF BOMBAY CITY FOR 1893.

(Dr. T. S. Weir.)

In the last Annual report I had to write that the unfavourable state of the public health which had been anticipated from the beginning of the year had been observed in 1892, and that the abnormal conditions of the seasons in the previous years which had been accompanied by high mortality in those years hed been followed by an even more unfavourable state of the public health, and a higher mortality in 1892. I have had often to remark that whenever in the sanitary history of the city, the season may be abnormal, it is accompanied or followed by an unwholesome state of the public health—by a deterioration of the health of human beings and animals.

The following extract from a note from the Meteorological Reporter is of much interest: "The present year is the fourth of a series of years characterised by very " marked and exceptional meteorological features. It was pointed out in last year's " forecast that the conditions in the winter of 1892-93 were so very unusual in " character as to point to the existence of abnormal conditions over a far larger area " than India. The year 1893 was even more remarkable than was anticipated in last " year's forecast. It was the coolest year on record in India, the mean deficiency " being more than twice as great as has been experienced during the past 20 years, and " the rainfall of the year was much greater than has been received many years during " the past 30 years. Years of increased rainfall in India, as a rule, occur in pairs."

I have after the very unfavourable record of 1892 to report in this year a very great improvement in public health, the mortality being 3,376 less than in that year, but only 197 less than the average. This is so far satisfactory, but it will not and cannot continue unless that more effective means for carrying away the water brought into the city are constructed.

I have had, before the new pumps were brought into use, to make serious complaints in regard to not merely stagnation, but a backward current in some of the drains.

Still, although the flow of sewage is more rapid now the sewers are full, and the sewage welling up the manholes till the forenoon Since the new pumps came into use there has been an improvement. If the level of the sewage at all hours has not been reduced there has not been a backward flow. The deposit of silt is also, I think, if not getting less more quickly moved forward, but there is the most serious fact that in the forenoon the sewers of the new system are so full that they may be said to be overflowing, and it is not possible to find room for a thermometer to take observations.

I am glad to state that a little progress has been made in the removal of nuisances arising from the absence of drainage, and that the system of sewers now in construction will, in a few years, effect a great improvement. The construction of sewers takes a long time, and it will certainly be another year before the nuisance I described in paragraph 11 of the last year's annual report have been removed.

For Parel, with a population more or less scattered I think the best system of house connection is a system of oval-open drains leading to sewers. This system is more or less in use in the Port; and in suitable localities I think it is by far the best. There are localities where it cannot be adopted.

A serious danger came under observation for the first time during this year. Very serious nuisance was observed in Mathew Road. On searching for the causes of the nuisance we discovered them in the manholes and the crown of the sewer. The sewer being full to overflowing, the sewage welled up the manholes, and the night-soil discharged in mass in the morning adhered to the sides of the manholes and to the sewer. This is a most serious danger, as all our sewers are overflowing in the mornings. Fœcal matter may adhere to the crown of the sewer or to the manholes, and it cannot be removed by flushing.

The Shone system of drainage, which has been adopted in Colaba, will be completed next year, but it will, I am afraid, be of no use for a year or so longer, as the connections from buildings to the system have not yet been sanctioned.

The drainage of Colaba on the Shone system, which is now proceeding, will not, I am very much afraid, give relief as soon as was expected. On urging that the house connections of some buildings where there are now serious nuisances should be carried out, I was informed that means had not yet been sanctioned for the carrying out of the house connections, and that until the estimates had been sanctioned, house connections could not be commenced. This is very discouraging, and it is unjust to the people who now suffer from the nuisances which must come where there are buildings close to each other and no drains. Colaba, like other portions of the city which have no drains, requires immediate relief, and for years I have recommended that until a system of drainage had been carried out, open drains, to carry the bathroom water, should be constructed to the harbour. The Port Trustees have objected, but they have no good reason to object to what is so necessary to this portion of the city. The drainage of bathroom water into the sea here could do no harm, and could cause no nuisance.

The reclamation on the Flats is now conducted under the greatest difficulties. The swamp having been reclaimed, garbage has to be deposited at many points, and has also to be heaped up—fresh refuse on refuse decomposing. It is not practicable to have roads to each point of deposit—the result is that carts have to be dragged through soft refuse or over what is practically a dung-hill. The strain on the bullocks is terrible. The position now is this. Between this and the next monsoon a new place must be found for the refuse. I feel the difficulty because I am responsible for the present reclamation. I commenced it against the opinion of the Sanitary Commissioners, and by continuing it the Municipality have saved each year about a lakh of rupees since 1878. An enormous saving has been effected by the reclamation, but that saving must now come to an end.

After this year I shall refuse to remove the refuse to the Flats until I receive a special order to do so. I shall not take the responsibility any longer.

During the year I drew up byelaws for offensive trades. The byelaws have been, after some alteration, passed. I am afraid, however, that our views in regard to the location of milch cattle stables will have to be modified. Milk changes rapidly in this climate, and if the poor classes are to obtain milk, there must be stables not far from where they live. I do not think it is possible to reduce the number of stables without increasing the difficulty of obtaining fresh milk by the poor and without causing injury to the health of the poor, and especially to the health of the children of the poor. I feel now in regard to the milk supply that, we must be careful not to do anything that will increase the price of milk or increase the difficulties of obtaining fresh milk, or drive the stables outside the Island, where they are under no supervision. We may while doing good in one direction do more harm in another direction.

I regret very much that the drainage of the locality to the east of the Government House tank cannot be connected with the new system of drainage in Parel. The drainage from some chawls in that locality runs down a lane on to and over the public road.

House Connections.—The Committee appointed on House Connections after my report for the first quarter of 1892 have continued during the year their deliberations and enquiries on the best system of connection between building and sewers. The enquiry has brought home, I think to all, the difficulties of the question, the difficulties of deciding which is the best form of connection between the house and the sewer. It is becoming clearer and more certain to me that for challs and the houses of the poor, a system of pipes connected at one end with the vertical pipes from these buildings and at the other end with the street sewers, or in other words the gully pipes will not do however disconnected. There is not only obstruction, as the Committee have seen, but the cost of the system—the expense of the system will kill it. I have given evidence many times before the Committee. My evidence has been generally to this effect.

I. That for the houses of the poor the best system is a system of open drains or gullies well constructed and well flushed between the houses and the sewers.

II. That the down take pipes are not large enough.

III. That there should not be a syphon in the house or gully pipe.

IV. That a syphon to a trap underneath a down take pipe, is a cesspool—underneath a pipe leading to a room in which people sleep and cook, and that a syphon in this position is therefore dangerous.

The population for house connection purposes may be (broadly) classified into two divisions—the classes who eat on plates and the classes who eat on leaves. This is,

from a sanitary point of view, the great division of the population. The requirements of each class have to be considered. I do not think that a system of horizontal pipes should be placed to any building in which the people use leaves for domestic purposes.

It must be taken as a practical fact that the people who use leaves will throw them out of the windows or from the back of the houses into the gullies below. Just as it must be taken as a practical fact that in each cook-room of the classes who employ servants, cuttings from vegetables and feathers and refuse will be put into the pipes leading from the cook-room; even in buildings occupied by Europeans, it is so; for he servants do this, as we see in buildings in the fort in the cook-rooms. The other great distinction is between the rich and the poor. It has always seemed to me that the placing of pipes and an expensive system of house drainage to a hut or a chawl occupied by the poor was calculated to bring scientific drainage into ridicule.

As I have already stated, I do not think that any one system of house connections should be adopted. The system should be modified according to the views of the engineer acting if necessary after consultation with the Health Officer and the wishes of the people themselves. I think that in many cases the wishes of the people who have to use house connections ought, as far as possible, to be consulted.

In conclusion, I may express a hope that I shall at a convenient opportunity, be given leave here to inspect and report on the systems of house drainage in Calcutta, Rangoon and Madras.

There can be no question that given systems of drainage equally good for the public health, the system which is the simplest is the best. The more I see of the new drainage system in this city, the more I am convinced that any system which is difficult of repair will not be kept in repair. We have seen this in this city since 1870.

Exclusive of still-born 23,142 deaths were registered, being 3,376 less than in the last year and 197 less than the average of the last five years. The mortality, according to the place of birth, shows that the reduction of mortality has been greatest amongst strangers. In the previous year I pointed out that the enhancement of mortality was chiefly amongst strangers. There is one point I would draw attention to, and that is the enhancement in the mortality both amongst Bombay born and strangers in August.

The highest mortality occurred in 2nd Nagpada district (47·10), to which I will refer afterwards. The second highest mortality has occurred in Parel (39·07), which was the section in which the highest mortality occurred in the last year. At Lalwady, Parel, there are frightful nuisances almost opposite a market and the entrance to the gasworks. The sewage from chawls trickles into the Dinshaw Petit Mill tank. All these new houses—a group of "chawls"—have pipes down the sides, and these pipes, instead of doing good, are increasing the danger.

The condition of the groups of chawls I now refer to, from want of drains, is fearfully dangerous. The Health Department took proceedings to abate the nuisances from want of drainage here, but the magistrate decided that the department of the Engineer, and not the Health Department, should take action. I have in my former annual reports and quarterly reports described the fearful conditions from water and sewage in pools; of these I need only refer to one case—to this nuisance around chawls alongside of a public road, and I earnestly hope that the nuisance may be removed within a short time.

The third locality of highest mortality is Kamathipura (38·69). The defects in this locality I have frequently referred to; although there is a system of drainage, it is an imperfect system, because the level of the subsoil is so high that it is scarcely affected by the monsoon floods, and be it remembered that the subsoil is an impure one. We have had an illustration of the truth of the opinion I gave in the last annual report in the case of a mill tank in which the ooze from the subsoil came up into the tank through, as I believe, the pressure caused by the additional supply of water to the district. The water in the mill tank was so offensive that the nuisance from the tank could be perceived for hundreds of yards around. The tank had to be emptied, and even then the nuisance did not cease, for the foul ooze came up through the floor. There was also a well near the tank polluted. I believe this pollution of the tank and well was caused by the increased pressure on the subsoil water, caused by the additional water-supply thrown on the district. The mill tank is about 20 feet deep, and we saw the ooze coming up. To stop the nuisance the floor of the tank had to be made impermeable. It was exactly the same pollution as we have had before from

percolation of refuse into wells. I remember an instance in Colaba, low ground was raised with refuse, the rain came and washed through the refuse into a well. The smell that came up was fearful, and was perceived a long way off.

Of the six districts of highest mortality, only two can be said to be drained, and the drainage is not complete in one of them. Parel needs not only drainage, the greater portion having no drains, but reclamation and raising.

Table showing the Number of Deaths and the Death-rate from Different Causes in 1893.

Causes of Death.	Number of Deaths.	Death-rate per 1,000 of Population.
Small pox - - - -	201	·24
Measles - - - - -	289	·35
Fever - - - - -	5,844	7·11
Cholera - - - -	147	·18
Phthisis - - - -	3,327	4·05
Diseases of the Nervous System -	2,084	2·54
„ „ Respiratory System -	4,551	5·54
Diarrhœa - - - -	1,173	1·43
Dysentery - - - -	525	·64
Accidents - - - -	453	·55
All other causes, except Still-born -	4,548	5·53
Total - - -	23,142	28·16

Compared with the previous year the results are a decrease in the mortality from all the chief death causes. For instance take the mortality from epidemic causes, small-pox, measles, and cholera, there is a decrease of ·96 per 1,000. The mortality from fevers is 7·11 against 9·43 in 1892.

With the reduction in general mortality there is a great fall in the mortality of children under one year of age. The mortality being 254·8 per 1,000 against 306·9 in 1892. At all age periods after four years the mortality in 1893 is less than in 1892. But while the mortality of infant life is less, the mortality of females during the child-bearing period of life has again this year been much higher than the male mortality. It is true that the female mortality at these periods is less than in the year before, but it still bears the same fearful ratio of excess to the male mortality.

The mortality by communities or classes is a true indication of the sanitary conditions influencing each community. We find this year the mass of the Hindu population with a mortality of 23·8, and the Hindu out-caste, or Hindu low-caste as we call the class in tables, with a mortality of 43·2. Here we have the poor and the insanitary living in crowded rooms, several families in one room, a custom unknown to any other class, on damp floors and eating often food picked up in the streets or garbled from or near the dust-bins. It is true that the mortality of Hindu low caste is less than in 1892, but it is still very high.

What must be done for the Hindu low caste if the mortality is to be lessened? The Municipality must build dwellings for them and give medical relief and charity to them. This is what must be done. The mortality of the mass of the Hindu population is as much as 4·29 less than in 1892.

Although the Mussulman mortality is high (37·23), it is 4·02 less than in 1892. I ascribe the high Mussulman mortality to two causes—immigration of poor Mussulman and imperfect ventilation and lighting of their dwellings.

The Parsee mortality is as low as 22·27.

The mortality of the small communities is subject to great fluctuations and deductions from the mortality of these peoples cannot be accepted with any certainty.

Measles.—We have with a smaller mortality from small-pox a fewer number of deaths from measles; 289 deaths were registered, being 421 less than in the last year, and 183 less than the average. In 1892 with the increased mortality from small-pox there was a greater mortality from measles and a high mortality from diseases of the respiratory system. It will be observed that in the community in which the greatest number of deaths occurred last year there are no deaths this year. This is the community of Jews. The highest mortality occurred amongst Hindus low caste, and the other community in which the greatest mortality occurred is Brahmins. No deaths from measles were registered amongst Europeans.

Small-pox.—Small-pox can scarcely be considered to have been epidemic; 201 deaths were registered, being 340 less than in the year before, and 116 less than the

average. The highest mortality occurred amongst Negro-Africans, but the community is a small and fluctuating one, and the mortality was caused by two deaths only in a community of but 146 persons. Of the large communities—although a community subject to fluctuation—the highest mortality occurred amongst Native Christians. Hindu low caste had the next highest mortality.

Fevers.—5,844 deaths were registered from fevers, being 1,967 less than in the last year, and 1,153 less than the average. It has to be remembered that in 1892 the total mortality from fever was 914 more than in 1891. Examining the mortality further, it will be observed that 4,730 are referred to remittent fever, being 1,554 less than in the last year, and 820 less than the average; 831 are ascribed to simple continued fever, being 240 less than in the last year and 252 less than the average; 262 are referred to ague, being 115 less than in the last year and 84 less than the average; 21 are ascribed to enteric fever, being two more than in the last year and three more than the average. The increase of mortality from enteric fever may, I have no doubt, be ascribed to more medical men having attended cases.

The mortality by districts is suggestive, although the total mortality is less, and the mortality in each district is also less. It will be observed that in the districts of highest mortality in 1892, there is also a high mortality in this year, although the incidence of mortality is not the same as in 1892. In 1892 the three sections of highest mortality were—Parel, Sewri, and Mandvi. In 1893 the three sections of highest mortality are Mandvi (12·84), Parel (10·99), and Chuckla (10·96). In 1892, highest mortality occurred in two districts of the suburbs—Parel and Sewri in which the mortality ought to be low, and in this year—1893—while the highest mortality is not in Parel and Sewri, in both sections the mortality is high.

There has been a little improvement in Parel through the construction of a sewer from Chinchpoogli Station to Parel village, but the serious nuisances described in my last annual report, paragraph 24, are only a little less offensive. The foulness from drainage is a little less. A sewer is urgently needed from opposite the Victoria Gardens to Dadur Station with tributaries up Chinchpoogli Road, Kala Chowky Road, and Elphinstone Road.

The open drains up Elphinstone Road might be repaired, cemented and made oval in shape. The open drains now discharge on one side on to the open ground near the Railway Station—on the other side into a ditch—horrible foulness between chawls occupied by many people within a few yards of a railway station—until it ceases to flow.

In Mandvi and Chuckla sections of great house piling and crowding, not only is improved drainage necessary, but roads to give light and ventilation are urgently necessary.

As in former years the highest mortality occurred amongst Negro-Africans (47·94). This is a small community, and it has increased, and this, I think, is the explanation of the high mortality. The greatest decrease of mortality has occurred amongst Hindu low caste, it is equal to 8·9 per 1,000.

Cholera.—147 deaths were registered from cholera, being 22 less than in 1892, and 11 less than the average; 193 cases came to my notice, of which 147 were fatal, giving a mortality of 76·16 per cent.

The incidence of mortality by districts, although cholera was not epidemic at any one period or in any one district in any one locality is interesting. The highest mortality occurred in the Esplanade—1·78. I ascribe this to the large proportion of low caste and poor in a district of small population. The second highest mortality occurred in the Harbour (0·63). The third highest mortality occurred in Dhobi Talao (0·35), the fourth in Byculla, and the fifth in Oomarkhari and Mandvi. In six districts no deaths from cholera were registered.

As in previous year most of the cases came from the population outside Bombay, and it will be observed that the mortality amongst people born outside of Bombay was higher than amongst the people of the city. The cause of this is obvious; most of the people, who were strangers, who suffered from cholera, were poor and were not as well cared for as the people whose homes were in the city.

Birth place.	Attacks.	Deaths.	Percentage of Deaths to Attacks.
Bombay - - -	28	16	57·1
Elsewhere - - -	157	123	78·3
Unknown - - -	8	8	100·0

If the cases are grouped according to the period of residence, it will be observed that 38 were under three months in the city, and 28 under six months :—

Duration of Residence in Bombay.	Attacks.	Deaths.
Under 3 months - - -	38	29
Under 6 months - - -	28	26

The mortality, according to the source of water supply, is interesting. There is a decreasing number of well-water drinkers. Good as most of our water supply now is, it is but one of other conditions which we must have to preserve the population from epidemic influences.

For 1893.	Attacks.	Deaths.	Percentage of Deaths to Attacks.
Vehar, Tulsi, and Tansa water consumers.	173	129	74·5
Well-water drinkers - -	6	5	83·3
Unknown - - -	14	13	92·8
	193	147	

The mortality from cholera, assuming that the rainfall will neither be scanty nor excessive, and that the population in this city or coming to this city will never be famished for want of food, will not be so great in the future. There will not in the future be the great mortality from cholera that there has been in some years in the past, but to believe as some do believe that with a plentiful and pure supply of water there will be no more epidemics of cholera, is, in my opinion, to believe in a delusion. Pure water is one most important condition, but there must be pure air and plentiful food and abundance, too, for the prevention of epidemics and the protection of the public health.

Phthisis.—The mortality from phthisis, although less than in 1892 by 211 deaths is 341 above the average. The mortality is equal to 4·5 against 4·30 in 1892. The localities of the highest mortality are the same as in the last year, Chuckla (7·73), second Nagpada (7·72), and Oomarkhari (6·42). and it is a significant fact that the districts of highest mortality from phthisis are the same in 1893 as in 1892. This is significant. These are three districts of insufficient house ventilation and great house crowding and insufficient drainage.

Digestive System.—The mortality from diseases of the digestive system is 124 less than in the last year but 103 more than the average of the last five years. Of the deaths from diseases of the digestive system, 1,173 were ascribed to diarrhœa, being one more than in the last year, and 131 more than the average of the last five years, and 525 were referred to dysentery, being 126 less than in the last year and 68 less than the average. To all other diseases of the digestive system 606 were referred, being two more than the last year and 40 more than the average.

Respiratory System.—To diseases of the respiratory system 4,551 deaths were referred, being 50 less than in the last year, but 473 more than the average. Of the deaths from diseases of the respiratory system, 2,762 were due to bronchitis, being 157 less than in the last year, but 216 more than the average, and 1,169 were ascribed to pneumonia, being 132 more than in the last year and 276 more than the average.

Nervous System.—From diseases of the nervous system 2,084 deaths were registered, being 246 less than in the last year and 76 less than the average.

Births.—The number of births this year is 267 less than in the last year; 15,218 living and 1,510 still-born births were registered. Of the living births 7,875 were males and 7,343 females. The proportion of males to females by the Census of 1891 was 170·60 to 100; and assuming that there were 100 males to 100 females, the birth-rate would be equal to 31·57 per 1,000.

APPENDIX

No. 1.

MEMORANDUM by the ARMY SANITARY COMMISSION on the REPORT of the SANITARY COMMISSIONER with the GOVERNMENT OF INDIA for 1893.

1. *Question of curtailing the annual statistical tables.*—This report, as usual, contains an excellent account of the sanitary history of the year to which it refers. The statistics, more especially of the troops, both European and Native, are dealt with very fully, and in addition a valuable *résumé* is given of the main facts concerning the general population of India, showing what was the health of the people in the various provinces, the progress which is being made in the registration of births and deaths, the history of the chief diseases, what advance has to be recorded in vaccination, and what has been done to improve the sanitary condition, not only of the larger centres of population, but also of the rural tracts and villages throughout the country. There is no lack of information on these large and important questions, particularly as regards the troops and prisoners, the statistics of which are given with an elaborateness of detail which evidences great care and industry. We are, indeed inclined to conclude that this very wealth of detail is somewhat embarrassing, and that the question of curtailing these statistical tables is one which deserves consideration. In the Report for 1892 the statistical tables at the end of the volume, all relating to troops and prisoners, occupied 260 pages, and in this Report for 1893, even when the decennial tables to which we took exception in our Memorandum on the 1892 Report have been omitted, the statistical tables still take up 229 pages. This is a very formidable mass of figures to be added year after year. Their mere extent repels the attention which they deserve, and the difficulty of getting at the great facts is increased by their very voluminous character. So long as the desired information is forthcoming, every table that can be curtailed or altogether omitted, represents so much gain in a clear and concise record of the events of the year. In statistics, as in many other matters, experience is a great teacher, and after the experience of the last thirty years, during which these tables have gradually attained their present proportions, the question arises whether they may not, to some extent, be remodelled and curtailed without diminishing their value. The time seems opportune for putting this question, because the arrangements under which four Army Corps have just replaced the three Presidential armies necessitate some changes, and if any other changes should be deemed desirable, it is well that they should all be carried out simultaneously.

2. *Practical objects for which the statistics are prepared.*—We believe that a good deal might be done in the direction indicated with decided advantage. We would not advocate any radical change in the principles on which the statistics are based, which were first adopted by the late Dr. Bryden, and the wisdom of which has been fully vindicated by his own work during many years, and by that of his successors since. We propose only to touch the details, but before explaining how this may best be done, we would first consider what are the practical purposes for which these statistics are prepared. Stated shortly these are:—

(1.) That the military authorities may know the extent of inefficiency due to sickness and death in the different Army Corps, and the bodies of men of which the Army Corps are composed, as well as the principal diseases to which this inefficiency has been due.

(2.) For the study of disease from an epidemiological point of view, so that its incidence over geographical areas and in the various stations and bodies of men occupying these areas may be put on record, and the facts considered both generally and in respect of particular localities.

(3.) For the discovery of local causes of disease in stations or in the lines occupied by individual regiments or in jails with a view to their removal.

These may be regarded as the main heads under which the practical objects can be conveniently grouped. Under each of them are many subheads. Under the first, for example, especially as regards European troops, come the influence of age and length of tropical service, the effect of hill climates, and others that might be mentioned, but into these details we need not enter.

3. *Changes proposed in the tables for European troops.*—Bearing the great practical objects in view, and the minor matters which naturally range themselves under each, we shall now explain what changes we would recommend, and in order that our meaning may be more plain, we shall take the tables seriatim. We would, however, premise that we make these recommendations only as suggestions. The whole of them need careful examination, and nowhere can this be made so well as in the office of the Sanitary Commissioner with the Government of India. Aided by his statistical officer, who has had the valuable experience gained in the working of the tables for years, he can best judge what changes, if any, are desirable, and he will fully appreciate the object we have in view, which is not only to reduce the very formidable annual array of figures as much as possible, and

so do away with any needless labour, but also to leave the statistical officer more leisure to study the facts, for it is only so far as the figures are studied, and the practical action which they teach as the outcome of this study, that they are of any use. We shall, for convenience sake, follow the tables of the 1892 report, because they include the proposed decennial series, which, as we have already mentioned, has not been continued in the volume for 1893.

And first, as regards European troops, Nos. 1.—IV. deal with the armies of India, and the three separate Presidencies. Under the new organization, if the present plan of tables were continued, there would be five—one for India, and one for each of the four Army Corps, but what we propose will be sufficiently clear by taking the numbers as they now stand. No. V. is a summary of I.—IV., and contains nearly all that is necessary. We would omit I.—IV., and make No. V. (it would then be No. I.) more complete by giving the actuals as well as the ratios throughout, and, instead of showing "Fatality" in Section V. of this table, show the "composition of 100 admissions."

The next 12 tables deal with sickness and mortality in the different geographical areas into which India has been divided for the purpose of these statistics. We would omit them all, retaining the summary of them, which forms No. XVIII. The portrayal of epidemic disease such as cholera, influenza when it occurs, and the like, and of other important diseases, such as fevers of all kinds, and dysentery, is very important, but there are many items in these geographical tables which are altogether uninfluenced by geography. There are already separate tables for all epidemic diseases, and for some of the more important non-epidemic diseases. These separate disease tables might, perhaps, be extended so as to include all fevers, and also dysentery, and in every table of this kind the stations should continue to be shown in groups, and the totals of each group should be added to the information they now contain. On the other hand, in XVIII. the detail of the diseases might be reduced. This would retain all that is wanted, and would avoid the repetition of the same figures which occurs here, and in any other parts of the tables, and tends to confusion.

No. XIX. to be retained, and group totals added.

Nos. XX. and XXI. to be retained, with group totals added, and specific disease reduced in number.

No. XXII. might be omitted.

No. XXIII. to be retained when influenza or other special epidemic falls to be recorded.

Nos. XXIV., XXV., and XXVI. to be retained with group totals.

Nos. XXVII. to be omitted.

Nos. XXVIII. and XXVIIIA. to be retained with group totals.

Nos. XXIX., XXIXA., and XXX. to be omitted.

No. XXX. to be retained, except the column for invaliding, which is now misleading, as the entries in it refer rather to the station where the invaliding boards are held, than to those where the sickness which caused the invaliding was contracted. It would also be an improvement to make the nature of the diseases specified more plain. "Diseases of group C.," or "group D." are, no doubt, well known to the medical authorities, but convey no meaning to military officers or other readers who may desire to study this table.

4. *In those for European women and children.*—Following the same principles as those above indicated in our remarks on the series for European troops, the other divisions of the tables might, we believe, be largely curtailed without the loss of any important details. As regards women and children, the first ten tables might be omitted, and their place taken by two summaries, one for women, and the other for children, arranged on the same plan as the new No. I. we have suggested for European soldiers. The present Nos. XI. and XII., which show the distribution of cholera during the year among women and children, should be retained, with the group totals added, and similar tables should be given for fevers and any other diseases which are required to illustrate the history of the particular year in question. Nos. XIII. and XIV. might be left out.

5. *Those for the Native troops.*—On the same plan as that suggested for the statistics of the European army, the first six tables for Native troops might be omitted. No. VII., modified after the same pattern as that suggested for European troops (new No. I. of that series), would become No. I. of the Native troop series. Tables VIII. to XIX., which deal with the distribution of sickness and mortality, according to geographical areas, might be summarized as now in the existing No. XX. We have already explained the reasons for thinking that this large reduction might be carried out without any real loss. We may add that the geographical areas are, to a large extent, arbitrary, and that although it is very interesting to compare results among different bodies of men in the same geographical area, which was the object in view in devising these tables, the comparison is vitiated to a large extent by the fact that the particular places occupied within each of these areas are not the same. Many of the cantonments are garrisoned entirely by Native troops, and the objection has still more force in the case of the prisoners, for the jails are often situate far from any troops, either European or Native.

Nos XXI., XXII., and XXIII., might be retained, the group or area totals being added.

No. XXIV. might be left out.

Nos. XXV. to XXVIIIA. should be retained, with the addition of the group totals.

Nos. XXIX., XXX., and XXXI. might be omitted.

No. XXX., the regimental table, involves an immense amount of labour. No such table is given for European regiments, and the numerous small detachments into which regiments of Native troops are so often broken up, makes the work, in their case, all the more troublesome. We shall have a word to say presently in regard to statistics of individual corps, but shall first complete our remarks on the tables as they stand in the Annual Report for 1892.

6. *Those for the jails.*—The jail series alone remains to be considered, and we believe that in them also, large reductions are advisable. Taking them seriatim, we would omit the first 13 tables, and substitute for them No. XIV., modified in the same manner as in the similar tables proposed for the troops.

No. XV. to XX. should be retained, the group totals being added. No. XX. illustrates the distribution of cholera during the year, and similar tables might be given to show the distribution of the other principal diseases, such as fevers of all kinds, respiratory diseases, including pneumonia, which now is entered separately, dysentery and diarrhœa, and perhaps phagedænic and other ulcers, which are frequent in some jails, and which it is desirable to keep in prominent view, both as a matter which speaks ill of the sanitary condition of the prisoners, and also one which deserves special attention in jail administration.

Nos. XXI. to XXIII. might be cancelled.

7. *The general summary.*—At the end of the tables a general summary is given which details "the "causes of admissions and deaths of the European and Native Armies of India, and of the jail "population." Although such a particular list of diseases is rarely required, it is well that it should be kept, in case any special information is wanted, and we would, therefore, retain it, but it would be more complete if two additional items were given, which are not now included in it: *first* the number of European soldiers invalided under each disease, and, *secondly*, the admissions and deaths of soldiers' wives and children.

8. *The decennial tables.*—The Report for 1892 contains three series of decennial tables, one for European troops, another for Native troops, and a third for prisoners. We have already stated in our Memorandum on that Report that we do not approve of this system of having what may be described as a running system of ten-year statistics, the period embraced in which would shift with each year's Report. The continual labour which this system involves must be enormous, and the results could be much more clearly and simply stated in another way. These decennial tables do not appear in the Report for 1893, and we conclude the best method of dealing with them is being considered. We do not propose to enter on the subject in this Memorandum, because if the old system of having a fixed ten-year period, which we much prefer, is revived, there will be ample time before the end of the current ten years, ending we believe, in 1901, to settle the question, and under any circumstances it is best to decide on the annual tables first, and take up the decennial series afterwards.

9. *Regimental tables.*—As already mentioned, the tables of sickness and mortality in individual regiments of Europeans have for some years disappeared, and we do not advise the continuance of the very elaborate regimental table for Native troops, which is given in the Report for 1892, but we are inclined to think that a simple form of table for regiments, both of Europeans and Natives, is desirable. It is not necessary to give full details of diseases. A few of the more important of them would suffice, such, for example, as cholera, fevers, dysentery, and diarrhœa, respiratory and venereal diseases; all the others being included under the general head of "other diseases," and the total admissions and deaths with the ratios being added. In the case of Europeans it would be well to enter the date of arrival in India, the station from which they have come, and where they were located during the year. In the case of Natives, similar information is desirable, so far as it applies to them, and note should also be made of the nationalities of which each is composed, for this has often a very direct bearing on the extent of the sickness and mortality. It will be observed that we do not suggest a separate record for each detachment into which the regiment, whether European or Native, may have been broken up, but that every regiment should be dealt with as a whole, the facts regarding detachments being recorded as an important item in its history. The statistics of individual regiments seem to be well worth placing on record, for over a series of years valuable deductions may be drawn from them. One very important question, for example, concerning Europeans, can be settled only by means of such statistics, and that is, in what order, so far as circumstances would permit, ought stations to be occupied by regiments during their Indian tour of service, so as to reduce, as far as possible, the effects of climate?

10. *Statistics of* 1893. *European Army.*—We turn now to the sanitary history of the European troops in India during 1893, and we are glad to note that the results as a whole are extremely favourable. The main blot on them is the high sick-rate, due, no doubt, in large part to the prevalence of venereal diseases, the admissions from which amounted to one-third of all the admissions into hospital throughout the year, and as many of these cases are very tedious, they probably swelled the constant sick-rate to even a larger extent than the proportion of admissions from this cause represents. In the army of India this constant sick-rate equalled 87 per 1,000, which is very high, especially when compared with the average of former periods. The admission-rate shows a substantial reduction on the figures of 1892, and the death-rate (12·61) is very favourable. The same general history runs through the statistics of each Presidency, taken separately—an admission-rate less than usual, a very high constant sick-rate, and a very favourable death-rate. In respect of this last item, the results in both Madras and Bombay are specially deserving of notice, for such a small mortality—9·54 in Madras and 10·13 per 1,000 in Bombay, had never been recorded before. The statements in paragraphs 9 and 10 of the report compare the results in the three Presidencies very clearly and concisely as respects the causes both of sickness and deaths. In all three venereal diseases head the lists of admissions into hospital, and in all three intermittent fever comes next; after these all other diseases take a very minor place. As respects deaths the order is very different, for in all three enteric fever is the greatest cause, the mortality it occasioned varying between 3·35 in Madras and 6·40 in Bengal. During 1893 the prominence of enteric fever as a cause of death

comes out even more strikingly than usual, because, with the single exception of 1·12, due to hepatic abscess in the Madras Presidency, there is no other disease which claims 1 per 1,000, and most of them fall far short of this.

11. *History of the chief diseases: Influenza.*—There are many points of much interest in this Report to which we might call attention, but the facts are so fully and clearly stated in the statistical tables and in the Sanitary Commissioner's comments on them that we shall confine ourselves to a few remarks on one or two of the chief diseases. The influenza epidemic had almost ceased among the European troops, for they returned only 21 cases throughout India, of which 19 occurred in North Bangalore, nearly all of them in the month of April. The Native Army suffered to a much larger extent, but the disease was chiefly confined to a few places, such as Edwardesabad, Dera Ismael Khan, and Dera Ghazi Khan, in March, April, and May, and to Peshawur, Lansdowne, and Quetta in the end of the year. It was at Lansdowne that the maximum admission-rate of 127 per 1,000 was reached, and all the cases occurred in December. As indicated by the jails, influenza was widely spread over the country from Burma to Madras north-westward on the frontier, and also in Berar. The total admission rate from this cause among the prisoners over India was much the same as among the Native troops, only 6·4, compared with 6·2, but individual jails suffered severely, the highest ratio of cases having been among a small body of prisoners at Buldana, 327 per 1,000, and the next highest, 286, at Jessore.

12. *Cholera.*—The most striking feature in the history of cholera during 1893 is its remarkable abeyance. Among European soldiers there were only 16 cases altogether, of which 10 were fatal. It is interesting to see from the details of Table XXIV. how very widely spread these cases were. Of the women, only two were attacked, and there was not a single case among the children. A similar abeyance of the disease is to be observed in the history of the Native troops during the year. The experience of the jails was to a similar effect. But few of them, compared with other years, returned cases of cholera, and in only five of them did the disease bear the characters of an epidemic. We have already noted in our memoranda on the separate provincial sanitary reports how very marked this same feature of cholera abeyance was in many parts of India during 1893. The results in all of them as compared with former years are strikingly shown in paragraph 104, where the figures for 17 years are tabulated. Omitting Assam, where the totals for the two years are much the same, and Hyderabad, where little dependence can be placed on the registration, the facts are very remarkable. The contrast between 1892 and 1893 is more marked in some provinces than in others, but in all of them, except the two above mentioned, it is decided. It embraces among others such entries as these in the cholera deaths of the two years :—

	1892.	1893.
North-Western Provinces and Oudh	194,886	12,154
Punjab	75,959	639
Central Provinces	39,972	557
Rajputana	26,760	314
Central India	8,384	127

There can be no question that there was a general influence over the country which affected the one year very much and affected the other very little; but once admit, as everyone must who has carefully studied the facts, that such a general influence is largely concerned in the results, although its nature is still beyond our comprehension, and the insufficiency of the commonly received theories to account for cholera epidemics becomes apparent.

13. *Enteric Fever.*—Although enteric fever continued to occupy such a prominent place in the list of death causes, it did not occasion quite so great a mortality in 1893 as it had done in the year previous. Next to the heavy death-rate the facts most deserving of notice are the wide distribution of the disease, its very unequal incidence in different stations, and the marked differences among them in the proportion of deaths to cases. Admissions into hospital took place in 90 stations, the ratio varying from 2 to 75 per 1,000. Only 22 stations escaped altogether. The relative fatality of attacks is recorded in 18 of the larger garrisons, with the result that, while in several of them it amounted to 11, or little more than 11 per cent., in others it was very much higher, culminating in a maximum of 54 per cent. at Peshawur. These facts are merely a repetition of similar facts which have been recorded in previous years, but it is necessary to keep them prominently in view in discussing the etiology of this disease and the measures best calculated to prevent it. We have also a repetition of striking figures showing the relation of enteric fever to age and length of Indian service. Year after year we have the same history—it is the young soldier, during his first and second years of India, who suffers out of all proportion to the men who are older, and who have become acclimatized to the country.

14. *Causes assigned for Enteric Fever.*—Extracts are given from the reports of the medical officers regarding some of the more severe outbreaks, and we may examine one or two of these to see if they throw any light on what occurred. The outbreak at Agra deserves special attention because, of the 48 cases which were admitted into hospital, 42 occurred in the East Surrey Regiment, and only 6 in the battery of Artillery occupying an adjoining barrack. The separate strengths are not given, and this is just one of those instances in which a regimental table such as we have suggested would have been useful. Typhoid bacilli were found in the aërated waters and in the *dahi* supplied to the

regiment, and these were believed to have been derived from contaminated well water, but nothing is said of the similar articles used by the Artillery, nor is any account taken of the immunity which both women and children at this station seem to have enjoyed. At Campbellpore also, where the outbreak is suspected to have been due to milk, no deaths from typhoid occurred among either the women or children, and there may have been no cases of the kind, but the tables for women and children do not indicate the distribution of the attacks by stations. Children consume more milk and water than grown-up persons, and ought to have suffered most if attack is dependent on the presence of a specific poison in either the one or the other. At Sialkot, where typhoid was prevalent among the men, it is noted that not a single case occurred among either the women or children, and yet here the disease was attributed to impure water. Several of the medical officers attribute attacks to emanations from the latrines. In these days the latrines are, as a rule, kept scrupulously clean, and any deviation from this condition would merit severe censure, but it would seem to be implied that the danger in question arises, not from any want of general cleanliness, but because the latrines had been infected by a specific germ derived from some soldier who had used the latrine in the early stage of the disease, before he had felt ill enough to go to hospital. Without clearer evidence on this point than exists at present it would be difficult to accept such a conclusion. Recent reports* on the result of investigations by Mr. Parry Laws on the micro-organisms of sewage and sewer air in London do not lend any support to such a view.

15. *Venereal Diseases.*—Venereal diseases prevailed to a lamentable extent, as they have done for years, and the returns for 1893 under this head are more unfavourable even than those of 1892. The very serious amount of inefficiency which these diseases caused in the European Army of India can hardly be more strikingly stated than the Sanitary Commissioner has already done, when he says that during the year 1893, 32,058 cases of venereal disease were admitted into hospital, each of which was under treatment for 30 days, so that the total loss amounted to very nearly 1,000,000 days of service. It is hard to conceive a more unsatisfactory state of things in every way, but how it is to be remedied is a problem which we confess we have been altogether unable to solve. After much consideration we recommended certain measures, which we understand are as far as possible to be acted on,† and we trust that at least some benefit may be derived from them, but we have not recommended the re-establishment of lock hospitals, partly because we are well aware that any recommendation of this kind would be a mere waste of time, and still more so, because the beneficial results of lock hospitals in India during the time they were in force fell far short of what had been anticipated, and are not such as to favour their being revived. The figures which are given in illustration of the increase of venereal cases during a series of years afford decided evidence on this point. In paragraph 24 there is a table for Bengal, comparing the years "1866, before the Contagious Diseases "Act was introduced, with 1884, when they were in operation, and with 1893," when they had for some years been abolished. It is quite true that the increase in this last year over the first year is enormous—the admissions had risen from 206 to 462, but after 19 years of the lock-hospital system what was the result? Instead of diminishing the cases had increased from 206 in 1866 to 290 in 1884 per 1,000. Similar results are to be found in Madras and Bombay, so far as the statistics of these Presidencies are quoted. We draw attention to the figures to show how beset with difficulty the subject is, and that the vast amount of inefficiency which these diseases cause cannot be so easily removed, as many seem to suppose. No doubt the increase in the proportion of young soldiers, and the decrease in the proportion of married men, as well as the fact that a much larger proportion of the men are new to the country, have had their influence on the results, and have tended to increase the amount of diseases of this class. If it would not involve a great deal of labour, we would suggest that the statistics of venereal diseases might with advantage be given according to age and length of Indian service in the same way as they are already given for enteric fever. All the facts regarding such a serious cause of inefficiency are of importance.

16. *The Native Army.*—Of the Native Army the most prominent feature in its sanitary history is the remarkable healthiness of the year. Never had the mortality from cholera been so low, or the admissions and deaths from other causes so few. This remark is true not only of the Native Army as a whole, but also of each of its parts. Bombay shows the highest ratio of admissions, 1,121 per 1,000, which is nearly as high as the ratio for 1892, but the cases would seem to have been comparatively mild, for in both Bengal and Madras, with a very much lower admission-rate, the constant sick-rate was very slightly below that of Bombay. Even in Burmah, where the returns are, as a whole, most unfavourable, the constant sick-rate and death-rate represent a very marked improvement on the rates of the year previous. In paragraph 51 the stations with high mortality, as compared with the general results of the year, are shown in a separate statement, but it is interesting to note that in every one of them, with the single exception of Quetta, the mortality of

* For the London County Council, 7th and 13th December, 1893.

† In regard to the only one of these measures about which there seems to be any difficulty we may extract here recent proceedings of the Army Sanitary Commission on the subject.

"With reference to the suggestion contained in their letter of the 21st December last, the Committee would observe that it was made under the assumption that if, as sometimes happens, several soldiers attributed their disease to intercourse with any particular woman, such woman might reasonably be required to leave the cantonment in the event of her declining to avail herself of the means of treatment to be obtained at one of the voluntary lock hospitals established for that purpose, where it would be ascertained whether she were suffering from any venereal disease or not.

"It seemed to the Commission that if a diseased woman would not go to hospital for treatment she should not be allowed to remain in cantonments and carry on her trade in that condition.

"The Commission believe that since the date of their communication the subject of the Cantonment Bill has been debated in the Legislative Council of India, and a decision arrived at by the Indian Government, under which it is understood that all personal examinations of such women have been rendered illegal. If this be so, the Commission can only repeat their opinion that some provision appears to be absolutely necessary to meet such cases as are referred to above."

1893 was less, and in many of them decidedly less, than that of 1892. At Quetta the death-rate rose from 16·71 per 1,000 in 1892 to 18·73 in 1893. Of the causes of deaths in these stations the most prominent is pneumonia. The mortality under this head at Meean Meer, Edwardesabad, and one or two other places, was heavy, the maximum of 12·58 having been reached at Peshawur.

17. *The prisoners.*—The history of the jails during 1893, like that of the troops, has been peculiarly favourable. Never, so far as the records stretch, have there been so few cases of sickness and so few deaths. The improvement, moreover, is not confined to a few provinces, but, with the single exception of Berar, it was marked in them all. These results were no doubt due in large measure to the healthy character of the year, from which all classes of the population benefited, but there is every reason to believe that the improvements which have been made in many of the jails are entitled to share in the credit. The sanitary sheets at the end of the section on jails record the extent of the sickness and mortality in each, and note at the same time any local conditions which are inimical to health. Leaving out the jails, where ratios drawn on a small population are apt to mislead, there are a few where the returns were very unsatisfactory, and we may instance some of these, and also the causes to which the results are ascribed. In Bengal proper, where the death-rate among prisoners averaged 32·34 per 1,000, there are several with high death-rates,—Jessore with 84·11, Mymensingh with 51·72, Backergunge with 43·48, Midnapore with 67·18, Bankura with 73·85. In the North-Western provinces nnd Oudh there are very few of the jails with a fair number of prisoners which return a high death-rate, and on the other hand there were many in which it was phenominally low. This last remark applies also to many in the Punjab, but the provincial average is unduly raised by heavy mortality at Amritsar and one or two others. In the Madras Presidency, Cannamore, with its ratio or 76·63, deserves notice. In this last case the sanitary sheet throws no light on the excessive mortality, and indeed, records no defect except a want of ventilation in the latrines. As regards the others, the causes at work in producing unsatisfactory results are,—1st, more or less overcrowding; 2nd, imperfect ventilation; 3rd, bad drainage; 4th, impure water; 5th, exposure on extra-mural labour, especially in the rains; and, 6th, the admission into jail of old and sickly prisoners. Among the convicts in the Andamans we observe that there was a large amount of bowel complaints, and that they are attributed to "a defective and ill-protected water-supply," an evil which ought to be remedied.

18. *Sanitary improvements.*—In our memorandum on the several Provincial Reports for 1893, we have commented on the progress which is being made in improving the sanitary condition of towns and villages. Section VIII. of this Report contains a record of the works executed for the health and comfort of the troops, both European and Native. The expenditure for this purpose during 1893–4 was Rs. 85,93,935, but particulars of what was done were not available when the Report was issued. The record for the previous year includes improvements in accommodation,—the construction of new barracks and hospitals and other buildings in the lines occupied by the troops. Some progress had also been made in providing a better water-supply for several stations. It is noted further that Rs. 94,000 had been expended during 1892–93 on the conservancy arrangements of six of the larger cantonments in the Bengal Presidency, and that Rs. 91,600 were to be spent for the same purpose on 19 of the other cantonments during 1893–94. A more detailed account of these operations and a list of the places in which they were carried out would have been of interest, and we would suggest that this should be given in future reports.

19. *Railways and Cholera.*—In conclusion we would draw attention to an interesting paper by Surgeon-Major J. Lewtas, "On the Influence of Railways in the Dissemination of Cholera." Dr. Lewtas commenced his inquiries evidently under the impression that the introduction of railways into India, and the great extension of them which has taken place, especially of late years, must have had some distinct effect on the frequency and direction of cholera epidemics, and his conclusions are on this account all the more valuable. The statistics on which these conclusions are based extend over a long series of years, and show very clearly that railways have made no difference in the behaviour of the disease. Epidemics are of no more frequent occurrence than they used to be before any railways existed in India, nor has the rate of their progress or the direction of their advance been affected in the smallest degree by them. We thus find in Mr. Lewtas' paper fresh confirmation of the views we have always held on this important practical question.

19th June 1895.

No. 2.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Bengal for 1893.

Slow Progress in Works of Improvement.—This Report affords renewed evidence of the interest taken by the Sanitary Department and the Government of Bengal in all matters relating to the public health, and also to the endeavours which are being made to improve the registration of births and deaths and otherwise to lead up to those works of improvement which are so urgently called for. But with all these endeavours it is disappointing to find that the actual progress made in carrying out such works is so small. The particulars now furnished in the latter portion of Form II. show how almost universal defects of the most serious kind are in the 705 registration circles of the province—defects under all the three great heads of drainage, water supply, and conservancy, while at the same time the last column of the same form which is intended to record the "measures taken "for the sanitary improvement of each circle" is often either blank or contains a note of some very trifling action towards remedying the evils described. On the other hand, it is gratifying to note that a considerable sum was expended by private individuals in works of improvement, such as the excavation of tanks and sinking of wells. In particular, the liberality of Raja Surja Kanto Achurja Bahadur in providing waterworks for the town of Mymensingh at a cost of Rs. 1,42,150 is to be noted. This and other minor instances which are to be found in Appendix V. are deserving of the highest praise, and it is to be hoped that many other of the wealthy inhabitants of Bengal may be led to follow these good examples. No doubt one great reason why Bengal has been so backward in sanitary works is the fact that the population is even more rural than it is in other provinces of India, and in all of them rural sanitation has been found to be a most difficult question to deal with. We entirely agree with the Lieutenant-Governor in believing that reform must be the work of gradual development, and that no lasting revolution can be effected in the habits of the people who now so habitually disregard the most elementary rules of hygiene "unless its derives its impulse from the "people themselves, or at any rate commands their sympathy."

2. *Means of educating the People in the importance of such Works.*—As this is the only stable basis on which real sanitary progress can rest, the first great step to be taken is to endeavour to educate the people in the importance of reforming existing abuses. Already something has been done in this direction by the teaching of a sanitary primer in the schools, by the inspections of the Sanitary Commissioner and his subordinate officers, and by the personal exertions of district and other officials. Something further might, we believe, be done by making the people more fully acquainted with what is going on in their own localities year after year, and for this purpose the facts recorded in Annual Forms I. and II. seem well adapted. If the portion of these forms which concern each district were rendered into the vernacular and circulated to all the registering circles of that district, the inhabitants might be led to take an interest in comparing the birth and death-rates of their own circle with those of their neighbours, and might learn what an intimate connection exists between it may be the low birth-rate or high death-rate and the manifest defects in local conditions. We have already suggested this measure in our memorandum on the Sanitary Report of the North-Western Provinces and Oudh for 1893 as a means of rendering the registration of births and deaths more accurate; but we believe that besides having this effect it might also lead to even more important results, towards which registration itself is only a means. It may be thought that it is too much to expect an ignorant villager to understand or take any interest in such figures, and no doubt it would be some time before the bulk of them did, but if only a few of the more intelligent and influential members of the community were led to do so, an important step would be gained.

3. *Want of System in levying Fines.*—There is another matter in connection with this gradual education of the people in sanitary affairs to which we may here refer, and that is the system or rather want of system under which fines are levied for breaches of the byelaws regarding the registration of births and deaths. Appendix II. is devoted to a statement showing how such fines were levied in each registering circle of the province. The orders of the Local Government draw attention to some of the anomalies which this statement discloses, as, for example, how in several districts not a single fine was levied. In the others the total for the district varies from two rupees and nine annas to Rs. 145. What is even more remarkable is the great difference in the extent of individual fines. In No. 80 circle the aggregate of 17 fines was Rs. 4 and 6 annas; in No. 77 the aggregate of two fines was Rs. 10. In No. 384 and neighbouring circles, which are grouped together 9 persons were fined Rs. 3 and 12 annas; in No. 404, 7 persons were fined Rs. 37; in No. 503, 3 persons were fined Rs. 15; in No. 510, 17 persons were fined Rs. 11 and 12 annas. Many other instances of similar inequality of fines might be cited, but the above suffice to illustrate the want of system to which we have above referred. No doubt the levying of fines was intended primarily to accustom or or educate the people in this important sanitary matter. We have long been struck with the unsatisfactory way in which such fines were inflicted, and were much impressed by the remarks of the Chief Commissioner of the Central Provinces on this subject, in his orders on the Sanitary Report of those provinces for 1893. After illustrating by the figures for that year the want of method in inflicting such fines, he says:—"The fines range from Rs. 5 a head in Gadarwara "to 4 annas a head in Hatta. In place of all this variety of practice the Chief Commissioner would "like to see the experiment tried of making fine the rule for breeches of the municipal byelaws for "the registration of births and deaths, but the fines should be nominal, ranging from one to four "annas. Warnings are no good, but a man remembers when he has had to pay a fine, however "small. The negligent citizen is not a criminal that he should be heavily punished, and fines that

" average five rupees a head are outrageous sentences, but it is necessary to bring all citizens to the " recollection that their byelaws do impose upon them a simple duty which they must discharge." We would commend these remarks to the authorities in all the provinces of India.

4. *Registration of Births.*—The records of 1893 show that the registration of births and deaths was decidedly improving and more especially the registration of births. This is only the second year in which the registration of births was general. In former years it was confined to towns and the results were most unsatisfactory. In 1892 the rate stood at 28·15 per 1,000 for the province as a whole, and in 1893 it equalled 35·66, the ratio in towns taken separately having been 26·27 and in rural circles 36·14. The much smaller birth-rate in the towns is attributed to the disproportion of the sexes in these centres of population, in many of which the males largely preponderate. This is no doubt true, and the fact accounts for the low birth-rate in many of the towns, but in many others the population is pretty evenly divided, and yet the birth rate is low. Form I. contains details regarding each of the 705 registration circles of Bengal, and in paragraph 9 of his Report the Sanitary Commissioner has given an abstract, in which the birth-rates of the town and country circles of each district are compared. From this it may be seen how far the results may be fairly ascribed to to a disproportion between the sexes and how far they seem to be due to neglect. For this purpose the evidence afforded by the more detailed record of Form I. is even more exact. Much pains are evidently being taken to improve the registration, and the decided improvement which has been effected bears testimony to the success which has attended these efforts. Much still remains to be done before the statistics can be accepted as nearly accurate, but no doubt a great and very gratifying advance has been made during the last two years of which Reports have been issued. In order to ensure further progress a careful watch must be kept on the statistics of each individual registration circle, both as respects its recorded birth rate, judged with due regard to the composition of the population, the state of the public health, and any other causes at all likely to affect the number of births during the year, and also as respects the proportion of male to female births. Under both these heads the entries in Form I. for 1893 present some remarkable contrasts, which are deserving of local inquiry.

5. *Registration of Deaths.*—The year was comparatively healthy, and the mortality registered fell from 31·92 in 1892 to 28·21 in 1893. But for the improved registration it is believed that the difference would have been still more in favour of 1893. Form No. II., which deals mainly with deaths, contains many entries on which comment might be made—entries of death-rates so low as to make it almost certain that many deaths in that circle had never been registered; of disproportion between the male and female death-rates which point to error somewhere; and, lastly, of very heavy mortality, associated in most instances with very evident and removable causes of disease. On this last point we need not enlarge further. The improvement of the local conditions among which the people live is the most important of all; the end, in fact, to attain which statistics and reports and every other like measure are but the means, and we trust that the entries in the last columns of Form II. will in future years show decided progress. Before remarking on the history of the chief diseases in Bengal during 1893, we may compare here the deaths registered under each head with the numbers of the year previous.

Causes of Deaths in Bengal during 1893.

Population by Census of 1891 = 71,069,643.

Causes of Deaths.	Number of Deaths registered.		Ratio per 1,000.	
	1893.	1892.	1893.	1892.
Cholera	126,976	259,398	1·78	3·68
Small-pox	14,531	22,359	·20	·31
Fevers	1,477,288	1,607,716	20·78	22·84
Dysentery and diarrhœa	41,150	48,491	·57	·68
Injuries: suicide	3,412	3,078	—	—
„ wounds and accidents	16,297	14,255	—	—
„ snake-bite or wild animals	11,602	10,371	—	—
Total injuries	31,311	27,704	·44	·39
All other causes	314,207	281,607	4·42	4·00
Total from all causes	2,005,463	2,247,275	28·21	31·92

6. *History of the chief Diseases: Cholera.*—The main fact in the history of cholera in Bengal during 1893 is that the disease was less prevalent than usual, and that, in particular, there was a marked reduction as compared with the year previous. The number of deaths attributed to this cause was, in fact, less than half what it had been in 1892, as may be seen from the figures in the statement above given. The diminished intensity of the causes producing this disease is further evidenced by the fewer circles in which it was severe, and the smaller number of villages attacked throughout the province. And yet the disease in 1893 was limited neither in time nor space, for in nearly all the districts it was present during every month of the year, and of the 705 registration circles 613 returned deaths from this cause. There were thus abundant centres from which the disease might have radiated if the commonly received opinions in regard to the spread of cholera are to be believed. Another feature worth noting is that parts of the province which suffered very little in 1893 had suffered much in 1892, and other parts where the epidemic of 1892 had been little prevalent

suffered much in 1893. Of the first class, the districts of Orissa are the most striking example, while of the second are those of the Dacca Division. It is instructive to compare the figures for the two years in both of these divisions:—

	Cholera.			
	Number of Deaths.		Ratio per 1,000.	
	1893.	1892.	1893.	1892.
Orissa Division—				
Cuttack	2,971	21,289	1·53	10·98
Balasore	1,825	14,926	1·83	15·00
Puri	1,753	10,686	1·85	11·30
Dacca Division—				
Dacca	17,610	5,513	7·27	2·27
Mymensing	18,573	2,554	5·34	·73
Faridpur	11,385	5,832	6·33	3 24
Backergunge	8,297	13,554	3·85	6·29

The only exception to the general rule is Backergunge, where, unlike the other two districts of the Dacca Division, the cholera of 1892 was much more severe than in 1893. We cannot explain these remarkable contrasts in the history of cholera, which, though they are by no means new in the experience of Bengal, are brought out very strikingly in the figures of these two years. The great prevalence of cholera in the province during 1892 was attributed by the Sanitary Commissioner to the drought in the early months of the year, the abnormally high temperature, and the progressive deterioration of the water-supply. In regard to the occurrences of 1893 he observes that, "the "unusually high mortality in October, November, and December must be attributed to the excessive "rainfall of the year." It is not possible to deal with such difficult questions over provincial areas, more especially when, as in 1892 and 1893, the cholera mortality in different districts varied to such a marked degree. The information given regarding the meteorological phenomena of the two years is not sufficient for forming any opinion. It would be interesting and instructive every year to examine the facts of meteorology month by month in a few districts, such, for example, as those of the Orissa and Dacca Divisions above quoted, and endeavour to ascertain how far they seem to explain such contrasts as those between 1892 and 1893, and how far they seem to account for apparent anomalies, such, for example, as Backergunge being an exception to the general course of the disease which was followed in the other districts grouped with it. So far as practical measures for the prevention of cholera are concerned, they all resolve themselves into improvement of local sanitary conditions, but all experience shows that with little or no change in such conditions one year cholera is extremely prevalent, while another year is comparatively free from it. It is highly important to make use of the facts in India to endeavour to ascertain what is the cause of such remarkable differences.

7. *Small-pox and Vaccination.*—It was only in the districts of Puri and Cuttack that small-pox can be said to have been prevalent. In the other districts an occasional circle returns a mortality of 2 or even 3 per 1,000, but it is remarkable how many there are in which the deaths amount only to a decimal point, and how many seem to escape altogether. Of the 705 circles only 384 returned deaths from small-pox. The operations of the Vaccination Department during the year 1893–94 are set forth in a separate report in which many details are given, and these again are fully reviewed in the orders of the Local Government. The two most important points noted in these orders are the small proportion of the births of the year that were overtaken by successful vaccination, and the almost incredible percentage of success claimed in primary cases. During the last 10 years the number of persons annually returned as having been successfully vaccinated has gone on increasing with little interruption, and the total for 1893–94 (1,809,718) shows a higher figure than that of any year except 1888–89, when the maximum (1,820,371) was recorded. But when these operations are taken by districts and compared with the small-pox mortality the results afford by no means marked evidence of that relation between the two which might have been expected. At page 12 of the Vaccination Report a diagram is given making such a comparison for a period of seven years, 1887 to 1894. No comment is made upon it, an omission to which the Lieutenant-Governor has already drawn attention. There can be no question that this is the most important part of the whole Vaccination Report, because on the evidence which it conveys the success or failure of the department must be judged. We would again draw attention to the confusion which continues in Bengal as regards the terms "Re-vaccination" and "Secondary Vaccination," and also to the alterations which seem to have been made in the standard vaccination forms. It is of great importance both for the proper understanding of the information which the forms contain and also for exact comparison between different provinces that no changes whatever should be made in them except such as have been approved by the Government of India and ordered for general adoption.

8. *Fevers.*—Of other diseases the only one which calls for remark is that returned under the general head of *Fevers*. The mortality under this class was, as usual, heavy, amounting as it did to 20·78 out of a total of 28·21. The Sanitary Commissioner has tabulated the districts in the order of their death-rates from *Fever*, and their ratio is found to vary between 35·43 and 7·70 per 1,000.

In considering these figures, however, as we have frequently pointed out, due regard must at the same time be had to the deaths registered under "all other causes," which, no doubt, are made in some places to include what in other places are entered under *Fevers*. We observe that in the districts where the mortality recorded from *Fevers* was highest the ratio under "*all other causes*" was small, and *vice versâ*. As an illustration of how the one set of figures affects the other we may take the two districts of Dinajpur and Backergunge. In both the mortality under the two heads combined is nearly the same, 31·38 in one, and 31·31 in the other, but in Dinajpur the fever mortality is 29·47, whereas in Backergunge it is only 22·44; on the other hand, the mortality ascribed to "*all other causes*" in Dinajpur is only 1·9, whereas in Backergunge it is 8·8. There can be little doubt that many deaths returned under "all other causes" are really of malarious origin, and that malaria is the main cause of sickness and death in the province. The Sanitary Commissioner observes that to remedy this the great want is improved drainage, and mentions that a Drainage Bill was before the Bengal Legislative Council, of which we hope to hear more in future reports.

8. *The Sanitary Board.*—No separate report has been furnished by the Sanitary Board, but a summary of their proceedings is given in paragraph 60. Their business was transacted by circulating the papers among the members, which was found more convenient than by holding formal meetings. The Army Sanitary Commission is strongly of opinion, however, that such meetings should take place as they offer great advantages, and the Commission considers that practical results are not likely to be obtained unless subjects are submitted for discussion at such meetings. Some progress was made in the survey of towns with a view to framing projects of improvement. Their most important work was the preparation of a scheme for supplying filtered water to the municipality of Howrah. In other matters they have been able to advise, and "the Lieutenant-Governor is "satisfied that their work for the year has been useful and important."

14th May 1895.

No. 3.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of the North-Western Provinces and Oudh for 1893.

1. *The Census of* 1891 *compared with results of Registration.*—The first point of interest in this report is the comparison between the population of the Census of 1891 and the population which it ought to have shown if the Census of 1881 had been amended by adding all the births and deducting all the deaths registered during the 10 years which intervened between the two censuses—a comparison between the census population and what the Sanitary Commissioner calls the deduced population. We have had some valuable information on this interesting subject in former reports, but the matter is here gone into in further detail on the figures as finally decided on. The statement, which shows the results district by district seems, however, not to differ from that which was given in the Report for 1892. The general outcome of the calculations for the province as a whole is that the census population of 1891 is less than the deduced population by 111,189, a small difference, considering that the province under either view numbers 47 millions of inhabitants. As a whole this is very satisfactory, but when we examine the details we find the results vary. In 22 of the 48 districts the deduced population is in excess; in the remaining 26 it yields a deficit. In most of those under the first category the variation is trifling; in only five of them does it amount to 5 per cent., and the maximum is 7 per cent. But in several of those included in the second category, the variation is considerable; in six of them the deficit amounts to 5 per cent., and in three of the districts reaches the maxima of 12, 14, and 15 per cent. These three districts are Kumaun, Dehra Dun, and Tarai. Reasons are given to explain the more serious discrepancies between the two records, among which emigration and immigration are the most important. The figures as a whole bear undoubted testimony to the general accuracy of the registration, a result on which the authorities concerned have good reason for congratulation, especially when it is borne in mind, as the Sanitary Commissioner points out, that the population of these united provinces (the North-Western Provinces and Oudh) exceeds that of the German Empire and of France by about 10 millions, and that of the United Kingdom by 12 millions, and also that the machinery by means of which the initial registration is conducted here as in other parts of India is of the rudest kind.

2. *Births of* 1893.—The registration of births in 1893 maintained a high standard. The provincial ratio, based on the Census of 1891 equalled 40·95, compared with 36·17 in 1892, but if the calculations be made on the deduced population the rate for 1893 stands at 40·55, the highest ratio attained for 13 years with the single exception of 1884, when it reached the maximum of 42·63. The incidence of the birth-rate by districts and towns is commented on in the Report, and very full information on the subject is contained in Form I., in which the details of every registration circle in the province are tabulated. This is a very large undertaking, for the circles number 1,182, and as regards each of them are shown the population according to sex, the births, the number of males born to every 100 females, and the proportion per 1,000 in which there was an excess of births or deaths during the year. We observe that in each district jails, dispensaries, and lunatic asylums all appear as separate circles. This seems hardly needed, while their introduction needlessly extends the statistics, which are otherwise necessarily very voluminous. They might be included in the circles

in which they are respectively situate. This, however, is a small matter, and there can be no doubt that, though the form fills a large space, it is very valuable, because it brings the birth registration of the province under complete surveillance, and as a whole the results are very satisfactory. Differences in birth-rates are to be expected, especially where the sexes are unevenly balanced, or other causes are at work affecting the population, but by taking the individual circles one by one the existence of such causes, if they do exist, are brought to light, and the attention of the local authorities can be drawn to any figures which seem to betoken neglect of registration. We may cite a few examples to illustrate the maxima and minima of some districts as regards both birth-rates and the proportion of such births, according to sex. We do not include cantonments, as the circumstances in them are peculiar as respects birth registration, and these places are not, therefore, suitable for comparison with other places.

Districts.	Average Birth-rate.	Circle Birth-rates.		Males born to every 100 females.		
		Maximum.	Minimum.	District Average.	Circle Maximum.	Circle Minimum.
Almora	35·58	43·78	28·57	106	115	86
Garhwal	30·64	40·09	14·03	103	137	94
Bijnor	46·98	64·03	12·32	111	200	96
Shahjahanpur	42·92	54·87	35·11	107	225	84
Dehra Dun	26·60	37·51	17·49	119	149	34
Meerut	41·79	63·94	23·80	113	125	93
Aligarh	45·46	65·83	28·39	109	131	97
Farukhabad	43·98	58·48	23·78	110	143	93
Mainpuri	38·50	84·22	29·68	113	126	106
Sitapur	43·83	62·18	24·51	110	122	98
Banda	34·68	51·82	15·30	112	139	89

We give these by way of illustrating the importance of examining the circle rates individually, for what appears a fair average for a district might really be composed of elements which more careful examination would show could not be accepted as even an approximation to the truth.

3. *Deaths in* 1893.—The death-rate of the year was the lowest ever recorded. It equalled only 24·10 on the census population, or 23·86 on the deduced population, the ratios for 1892 having been respectively 34·11 and 34·14. The year was, in fact, singularly favourable as regards all the great causes of mortality, and in no way can this be more strikingly exhibited than by placing the number of deaths recorded in it under the principal heads side by side with the record of 1892. They stand thus:—

	1892.	1893.
Cholera	194,886	12,154
Small-pox	7,709	5,992
Fevers	1,168,077	883,601
Dysentery and diarrhœa	42,448	34,556
Injuries	24,693	24,034
All other causes	162,240	169,880
Total	1,600,053	1,130,217

Under "Injuries" and "All other causes" there is some increase, but under all the other heads there is a decrease which is specially marked under cholera and fevers. Even in the district averages there is a great variety in the death-rates of 1893, the range being between 18·58 in Ghazipur and 37·52 in Moradabad. In both town and rural circles, as is to be expected, the variations in the rates of mortality are still more marked. For the province generally the town mortality was decidedly higher than in the rural tracts, the rates being 29·00 for the one and only 23·60 for the other. Although the year was so healthy, the seasonal rise and fall in the mortality was well marked, and followed very much its usual times, as may be seen by the diagram which the Sanitary Commissioner has furnished to face page 13. It is worthy of notice that all the 48 districts of the province returned an excess of births over deaths, and even among the circles taken separately there are very few which show the opposite. The general outcome of the registration shows an excess of 16·85 per 1,000 of births over deaths, or, in other words, there was a net addition to the population during 1893 of 790,614, the addition to the previous year having been only 96,374.

4. *Measures for improving Registration.*—Although the progress already made in registration is gratifying, the authorities are well aware that it is still by no means perfect, and measures for rendering the annual record of both births and deaths more accurate are constantly being kept in view. The vaccination staff has already rendered considerable help in this matter, and with judicious management, still further, and more extensive aid may be obtained from it without interfering with its primary work. Civil and police officers have also carried out inspections in order to test the records, and a statement is given at page 20 showing the results of such inspections in 32 districts. The amount of such work done varies greatly. In some of them the number of entries examined was very small, and it was only in the district of Azamgarh that the system was carried out to any large extent. Sixteen districts have not been included in the statement because the tests applied

in them were so few, but it would be well, as we observed in noting on the report for 1892, that the results should be noted in all the districts. The object is not to show these results only in those districts where a fair amount of accuracy has been attained, but also to record how far this important method of improving the registration has been actually carried into practice. Another point which deserves attention is the apparent want of some method in the infliction of fines within municipalities for neglect of the registration byelaws. In this matter the local authorities were more active than they had been, but the usual anomalies present themselves, both in the number of fines levied, and still more so in the scale of fines awarded. In Etawah only one person was fined, and the amount was one rupee. In Lucknow the only fine levied was two annas. In Nagina 16 persons were fined with a total of five rupees, while at Khurja the total levied on 17 persons was one rupee and three annas. We would commend to the notice of the authorities in all the Local Governments the practical remarks on this subject which are made by the Chief Commissioner on the report of the Sanitary Commissioner of the Central Provinces for 1893, to which we have drawn attention in our memorandum on that report. Forms I. and II., as is remarked in the orders of the Government of the North-western Provinces and Oudh, will prove of great assistance to the district magistrate and district health officer in bringing to notice the very varying elements recorded in the individual registration circles, as regards both births and deaths, the local sanitary defects which seem to account for high mortality, and the progress which has been made in remedying them. The portion of Form II. which deals with these defects and remedies is still imperfect. As regards many of the circles, there are no entries in the columns devoted to these matters, but such omissions will doubtless be supplied in future reports. Now that every district is dealt with in detail, would it not be well to have the annual results translated into the vernacular, and provide each one of them with copies of the sheet relating to itself in sufficient number to allow of the registration circles being supplied with at least one of them? The registration circle authorities might thus be led to take an interest in the matter by comparing their birth and death rates with those of other circles in the district, by seeing how far local insanitary causes were at work, and by learning what progress was being made towards their removal in the different centres of registration. If this were done, it would be advisable to explain that what is desired is not a high ratio of either births or deaths, but only an accurate record of all such events. It would do more harm than good if the people were led to suppose, as was, we are aware, once done in one of the provinces of India, that the places returning the highest ratios of mortality would be commended as having been the most active and accurate in their registration.

5. *History of the Chief Diseases: Cholera.*—As we have already seen, cholera was generally in abeyance over this part of India. Excepting 1874, no other year can show so favourable a record. Of the 48 districts, two entirely escaped, and in other six the disease was limited to two or three cases in each. In the remaining 40, although deaths from this cause were registered in all of them, and these deaths were as a rule distributed over many months, the mortality was less, and in most instances much less than ·5 per 1,000 with three exceptions. These were the districts of Garhwal, Gonda, and Bahraich, where the deaths equalled respectively 3·74, 2·52, and 1·32 per 1,000. It was only in these three that cholera can be said to have been epidemic. It is instructive also to observe that, taking the province as a whole, no month throughout the year was free from the disease, and yet its prevalence was confined to the three districts named. Its localization in these centres is well worthy of notice. It will be seen on reference to the statistics, and still more strikingly on the map, that neighbouring districts suffered little, and even in those three in which it was epidemic, the proportion of villages attacked was but a small part of the whole. If we are ever fully to understand the causes of cholera, we must study the events of a year such as 1893, in which the disease was comparatively rare, as well as those other years in which it proved destructive. In the International Sanitary Conference which assembled in Paris last year, we observe that the excessive mortality from cholera which marked nearly all the provinces of India in 1891 and 1892 attracted much attention, and was regarded as a source of the gravest danger to Europe. The Conference seem to have been unaware of the fact that in India there are periods of epidemic prevalence and of equally marked abeyance of the disease, and could the statistics of 1893 have been put before them they would have seen that the storm of 1891 and 1892 had been succeeded in 1893 by a calm equally striking, and that no evil effects to Europe such as had been anticipated had followed the unprecedented prevalence of cholera in India during 1891 and 1892. From an epidemiological point of view, the question which the sanitary authorities of the North-Western Provinces and Oudh have to endeavour to solve in regard to the history of cholera in that part of India during recent years is this. Why was it that the cholera deaths which numbered 169,013 in 1891 and 194,886 in 1892, number only 12,154 in 1893? Some great cause or causes must have been at work to produce such striking results—what were they?

6 *Small-pox and Vaccination.*—Small-pox is the only other disease to which we need specially refer, and the history of it in 1893 is very satisfactory. Under this head in 1892 the mortality (·16) had been lower than that recorded in any previous year. In 1893 this mortality was lower even than that of 1892, and equalled only ·13 per 1,000. In one of the districts no deaths from this cause were reported. In several of the others the number was only two or three. In Kheri they amounted to the maximum of 1·28 per 1,000. The nearest approach to this was ·63 in Bareilly; in all the others the ratios were low.* If we look at the details given in Form II., it is remarkable how many of the 1,182 circles in the province escaped entirely, and how low were the rates

* In the statement which faces page 30 there is a clerical error, the ratios shown being per 10,000 of population and not "per 1,000."

of mortality recorded in nearly all the others. Even in the district of Kheri, the comparatively high ratio of small-pox mortality is chiefly made up of deaths registered in a few places. The Sanitary Commissioner has given a series of statements and diagrams to illustrate the history of small-pox and vaccination during a number of years, and looking at all the evidence it seems very clear that it is to the successful vaccination of more recent times that the marked diminution in small-pox mortality is to be ascribed. The work of vaccination continued to make satisfactory progress during the year under review. The number of persons successfully vaccinated in 1893–94 was larger than it had ever been before. The chief goal which the Department is striving to reach is the protection of the infant population which is being annually born, and a statement at paragraph 74 of the Vaccination Report shows how far this is being done. In 1893 the greatest success as yet achieved was accomplished. The successful operations among infants under one year reached 27·17 of the registered births. Among children between one and six years of age the figure is 29·27. Much, therefore, remains to be done. The statement would be still more valuable if the various circles of vaccination were treated separately. An important change has been made in the organization of the vaccination staff, from which much benefit may be anticipated, the Civil Surgeons throughout the province have been made District Superintendents of Vaccination each within his own district. The supervision which they should exercise ought to prove of great assistance, and much important information should be obtained from the reports which they are enjoined to submit every year on the state of vaccination both in the municipalities and also in the rural tracts.

7. *Sanitary Works.*—In addition to many minor improvements, which are detailed according to districts, considerable progress was also made in larger and more important projects. Among these may be mentioned the remedying of defects in general drainage, especially in those parts where it seemed to have been impeded by the operations of the Irrigation and other branches of the Public Works Department; the Benares sewerage, the Cawnpore drainage, and also the Lucknow water supply schemes were advanced, and were approaching completion. Naini Tal was provided with sewers, and the water supply works for this settlement had also made good progress. Great improvements had been effected in the sanitary arrangements at Hurdwar, and the measures needed for meeting the wants of several other places were being considered. An important statement is given to compare the mortality in certain towns which have been supplied with good water during recent years, with their experience during those years when they were without this improvement. This statement would be more complete if in each case the exact date were shown on which the new supply came into use, and it would be well also to add the statistics during the same years of other towns in which no such change had been made. So far as they go the figures, as might be anticipated, are strikingly illustrative of the great benefits to be derived from a good water supply, but it is desirable to make the case in every respect as clear and convincing as possible. Now that the Deputy Sanitary Commissioners have been relieved in great measure from the direct supervision of district vaccination, it is hoped that they will be able to devote more time and attention to general sanitary matters within their respective circles.

8. *Sanitary Board.*—The Sanitary Board held several meetings during the year. The most important work on which they were engaged was the framing of rules to give effect to the Village Sanitation Act, and these were shortly to be brought into force. We shall look forward to seeing them in the next report. Towards the end of 1893 a change was made in the constitution of the Board. The Director of Land Records and Agriculture and the Legal Remembrancer ceased to be members, and the Sanitary Engineer was appointed member and secretary.

14th May 1895.

No. 4.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of the Punjab for 1893.

State of the Registration: Births.—Annual Forms I. and II. have now been expanded so as to show the results for each registration circle separately, and we are thus able to examine the state of the registration of both births and deaths throughout the province more fully than has hitherto been possible. The totals for every district are entered in both these forms, and above these are the details, first for the towns and then for the thanas or rural circles, each of these in every district having a separate serial number. It would be more convenient if the serial number were made to run through the whole province. This may seem a very trifling matter, but there does not appear to be any object in numbering the circles of each district separately, whereas by adopting one serial number the details of the two forms could be more readily compared for every circle. For the province as a whole the births in 1893 averaged 34·99 per 1,000, a ratio very nearly the same as that of the exceptional year 1891, and in common with it considerably under that of other years during which births have been registered in the Punjab. The causes to which this result is attributed by the Sanitary Commissioner are not sufficient to explain it, but as this has already been pointed out in the orders of the Local Government no further reference need be made to them here.

2. *Points deserving notice.*—There are two tests by which the accuracy of the birth registers may be tried, and the means for doing which are now provided in Form I. First, there is the range of registration in the various circles of each district, out of which units the general average of that

district is made up. In not a few of them the results which such an examination yields are very satisfactory, and there are no violent contrasts such as throw suspicion on the figures. In others, again, this is not the case, and the ratios for individual circles point to the necessity for local inquiry. Nor are these ratios always indicative only of omissions, for in many places they are so high as to be hardly credible. In Hissar, for example, with a general district average of 41·5 births per 1,000 of population, the rates for individual circles range between 31 and 95. In Mooltan, with a district average of 32·6, the range in the circles is between 19 and 142. This last district is bordering on the frontier, and in the frontier districts, as is naturally to be expected, the registration is most backward, but examples are not wanting in many other parts of the province of marked inequality of rates which deserve attention. The other test to be applied to the birth registration is the proportion between boys and girls. For the Punjab as a whole this proportion is given as 112 to 100, a high preponderance of males. In Berar and the Central Provinces the proportion in 1893 was only 106, and these are the only other reports for that year which we have yet examined. On this point, also, a comparison of the registration circles which make up the district totals affords a valuable check. In Muzaffargarh, for example, the proportion varies between 70 and 154; in Dera Ghazi Khan, between 106 and 188; in Kohat between 87 and 147; in Hazara, between 93 and 207. These are frontier districts, where inaccuracies are to be expected and among these inaccuracies the disproportion between the male and female births is always one of the most marked, but this disproportion is not confined to the frontier. In Gujranwala there are such extremes as 76 and 128; in Sialkot, 84 and 123; in Gurdaspore, 94 and 250, and so on with other districts that might be cited. We are fully aware of the difficulties attendant on the registration of births, more especially in certain parts of the Punjab, and we fully recognise the efforts which have been made to overcome them. We are satisfied also that in spite of inaccuracies the statistics contain a great deal of useful and valuable information. All we desire to point out is that Form I., as now extended, affords an excellent basis for examining the state of the birth registration n each district, and for taking the measures which are best calculated to make it more perfect.

3. *Deaths.*—The same may be said of the registration of deaths as illustrated in Form II. In regard to them the great general facts are that the mortality for the province as a whole was 28·13, or more than 21 per 1,000 less than it had been in the year previous, and that this marked decrease was general—every district in the province showed a large decrease. Nothing could well more forcibly illustrate the truth, on which we have so frequently insisted, that in point of comparative healthiness or unhealthiness one year differs from another in the most marked degree, and that the contrast is often not confined to one particular part of the country, but, as in this instance, is general over a province. What are the causes of these extraordinary differences we have yet in large measure to learn. What are they, and how far are they capable of being controlled? This is a large and very difficult question with which it is still impossible to deal, but we know the importance of discovering and removing local causes of disease, and this is, at least for the present, the field which must engage the efforts of the Sanitary Department. The changes now made in Form II. afford valuable assistance towards this end, for we have set forth side by side the mortality in each circle, the chief forms of disease under which this mortality has been registered, and the principal sanitary defects in it. According to districts, the death-rate varied from 20 in Hazara to 37 in Amritsar, but as was to be expected the range between individual circles is much greater than this. Even in the same district this range varies in a marked degree. In the Hissar district the maximum circle mortality was 40, and the minimum 19; in the Delhi district the extremes were 45 and 24; in the Karnal district, 48 and 21; in the Hoshiarpur district, 54 and 20; and similar extremes might be cited from other districts. We do not quote them as evidences of inaccurate registration. By no means. But they show the importance of considering the mortality, not by districts only, but by smaller and more circumscribed localities, so that the unhealthy local conditions which contribute to a high death-rate may be ascertained, and as far as possible removed.

4. *Measures for improving Registration.*—There is evidence that the registration of both births and deaths has improved, and we are glad to observe that its further improvement is not being lost sight of. The defects, especially those in the frontier districts, have been constantly brought to the notice of the local authorities, and as regards the province generally instructions have been renewed as to the importance which the Government attaches to the correct record of the statistics. The inspection of the birth and death registers by the native district officials has been enjoined, and district officers, besides inspecting the entries, are desired to explain to their subordinates what is the object of the registration, and enlist their aid in the endeavour to make it more correct. There can be little doubt that much valuable assistance can be rendered in this matter by the civil authorities. The Civil Surgeons and the vaccination staff are also being usefully employed with the same object, and we hope in future reports to have some details showing how far the examinations of the registers have been carried on in each district, and what information has been obtained from them.

5. *History of the chief diseases: Cholera.*—The marked contrast in the health of the Punjab between the years 1892 and 1893 is very strikingly exhibited in respect of cholera. In 1892 the deaths registered under this head numbered 75,959; in 1893 they numbered only 639. The epidemic in the former year, which was one of exceptional severity, was attributed in great measure to pilgrims returning from the Hurdwar fair. There had been an outbreak of cholera at that fair in the month of March, and the gathering had in consequence been broken up. As they returned to their homes many were attacked, and these attacks were believed in at least many of the districts to have been the origin of the outbreaks which subsequently occurred. In our memorandum on the Punjab

Sanitary Report for 1892 we pointed out the reasons which induced us to believe that this conclusion had been too hastily formed. In 1893 the circumstances were very different. As already stated cholera was not prevalent in the Punjab during that year. On the contrary the province was free from it in a remarkable degree; 13 of the 31 districts recorded not a single death under this head, in seven others the deaths numbered only one in each, and in only two of them, Montgomery and Gujranwala, can the disease be said to have been prevalent. The cholera of the year, moreover, was limited to a short time. During six months not a single fatal case was reported, and in only two out of the twelve was the number sufficient to cause anxiety. The maximum of 350 deaths in May and 256 in June were, in the main, recorded in the two districts above referred to. The contrast in the history of cholera in the Punjab during these two years, 1892 and 1893, although it discloses nothing beyond what has been frequently observed in cholera history, opens up many of those questions concerning the disease which are still very obscure. Among these is the origin of such epidemics. In this report the pilgrims from Hurdwar are again brought forward as the main cause of the subsequent attacks, but such a conclusion, although it was supported to a certain extent by the general history of 1892, finds no support in the very altered conditions of 1893, for there was no cholera at Hurdwar in that year's fair. We observe from the orders of His Honour the Lieutenant-Governor that the connection of the Hurdwar pilgrims with the Punjab cholera of 1893 had been made the subject of special investigation by the Government of India and that the conclusion arrived at was to the same effect as that we had already formed. All histories of supposed importation of cholera require most careful investigation, and even when they seem to be fully substantiated, they must still be taken in connection with the great facts which clearly point in the opposite direction. Of such facts there could hardly be one more striking than that brought out in Form VII., from which we learn that, during 1893, of 37,602 villages in the Punjab, only 80 returned deaths from cholera.

6. *Fevers.*—In regard to fevers the contrast between 1893 and its immediate predecessor is even more marked than it is in respect of cholera. The deaths from cholera had diminished by 75,320; the deaths from fevers had diminished by 326,384, and this decrease, as in the case of cholera, was spread over every district. The general fever death-rate of the province was little more than half what it had been in 1892. There can be no question that malarial fever is the most prominent form of sickness in most parts of India, and in none of them is this more strikingly exemplified than in the Punjab, a fact which has been brought out very forcibly in the experience of the last few years. Every means, therefore, of reducing this form of sickness deserves most anxious consideration. We observe that the Sanitary Commissioner has been called on to report fully on high fever death-rates occurring in swampy and waterlogged localities, and that he proposed to investigate this important matter in his next cold weather tour and embody the results in the succeeding Annual Report. In Appendix E. the vital statistics of certain selected villages on the Western Jumna canal are given in order to test the effect of the realignment of this canal on the health of the inhabitants. As the Sanitary Commissioner observes, the facts of one year are not sufficient for forming an opinion on this point, but they will in time afford valuable evidence, and no doubt be fully considered in this great, general, and most important question of drainage.

7. *Small-pox and Vaccination.*—The experience of another year bears continued testimony to the protection from small-pox which vaccination has conferred on the people of the Punjab. The statement which the Sanitary Commissioner makes on this point is worth quoting. He says: "The "average death-rate from small-pox during the first ten years ending in 1876 was 1·37; during "the next ten years the average fell to 0·96, and during the last seven years ending in 1893 it "was only 0·51. The maximum death-rate in any one year during the first decade was 3·05 "and the minimum 0·59; in the second decade the maximum and minimum rates were 2·83 and "0·34, and during the last seven years 0·90 and 0·17 per 1,000 respectively." This is very satisfactory. In looking at the details of Form II., it is interesting to observe that, although the disease was present in many places, it attained serious proportions in very few. We note that of the total of 4,085 deaths recorded during the year, the largest proportion by far was among children. Of infants under one year 1,033 died of small-pox and 2,573 other children under 12. How far is the infant population being protected? Of the total births of the year, which numbered 719,157, how many were successfully vaccinated? From the separate Vaccination Report we learn that they numbered only 405,367, plus 877 operated on by the dispensary staff. Making every allowance for deaths among infants and for other causes which might render them temporarily unavailable for vaccination, it is evident that considerable increase of effort is required to keep pace with the annual additions to the population. It would be well to keep this important point more prominently in view, by showing for each district the number of births registered during the year, the number of deaths from small-pox among infants under one year, and the number of infants under one year successfully vaccinated during the year under report. The percentage of such successful operations on the number of infants available for vaccination would afford an excellent check on the work of the Department.

8. *Meteorology and Food Supply.*—The great fever epidemic in the Punjab during the later months of 1892 was ascribed in great measure to the excessive rainfall which occurred in that period, and this conclusion is so far borne out by the experience of 1893, when the marked diminution of the fever mortality was attended with a decided diminution in the rainfall. The subject is discussed in paragraph 38, and a table is there given contrasting the results of the two years in a few of the districts where they were most marked. A more complete comparison, including all the districts, would have been interesting. In an inquiry of this kind it is desirable to take all the evidence available, and this can be done only by a careful comparison of all the data. The average rainfall

of each district, the actual fall in 1892 and in 1893, should have been shown side by side, while at the same time the statistics of fever mortality in each should have been compared, so that it might have been seen how far the meteorology of the one year differed from that of the other, and to what extent the amount of that difference appeared to govern the prevalence of fever. Appendix **A.** contains a comparative statement showing the mortuary and meteorological statistics of certain districts, together with the prices current of the chief food grains for 1893 and the five preceding years, but no comment is made on the information which it contains. Even although the facts recorded may not warrant any definite conclusions, it is very desirable that they should be carefully analysed year by year, for there can be little doubt that, although the problem is necessarily complex, both meteorology and food supply are two factors which exercise a very decided influence on the health of the people.

9. *Sanitary Defects.*—Form II., as it has now been extended, deals not only with the mortality in each circle and the diseases under which this mortality was registered, but it also notes the principal sanitary defects and the measures which are being taken for their removal. It is, therefore, a most important record, showing on the one hand the evils which have to be dealt with, and on the other the progress which is being annually made in dealing with them. Under the three heads of drainage, water-supply, and conservancy there is ample field for sanitary activity. We read of defective drainage in many places, of land being water-logged or subject to inundation, of water lodging in hollows from which there is no outlet, and which, in addition to the unhealthy dampness they cause, are frequently the receptacles of sewage. Under the head of water-supply we observe that in a number of places "it is described as brackish," in others it is liable to sewage contamination and not fit for drinking, in others again it is scanty and bad. In a number of places there are reported to be no defects in the water-supply, but no description is given of the source from which it is obtained. The conservancy is rarely attended to as it should be. Pools of sewage, manure heaps in and around towns and villages, dirty surroundings, are all frequent. In many places there are no conservancy arrangements at all. The existence of these evils is well known to the authorities, as is also the baneful influence which they have on the health of the people, and endeavours are being made to remove them or remedy them as far as possible. We are well aware of how vast and difficult a task this is, and we have referred to them, not as evidence of how little has been done, so much as to show that the real work of the Sanitary Department of the province lies in the earnest endeavour to improve the sanitary condition of towns and villages where, in spite of all that has yet been attempted, so many great evils still exist.

10. *Sanitary Works.*—The section of the report which is devoted to show what had been done during the year mentions a number of works of more or less importance. In this review 29 out of the 31 districts of the province are included. The Delhi waterworks had been nearly completed, and the drainage works were in progress. Waterworks for Umballa had been commenced; the Simla water supply extension had been finished, and also the drainage scheme for Ludhiana. Projects for water supply and drainage in other places were being considered. A number of works of public utility had also been constructed by private individuals at their own expense. We note again, as a point deserving consideration in other provinces, that in the Punjab during 1893 Rs. 1,13,733 had been realised by the sale of manure and town sweepings, a considerable sum, though not quite so much as in 1892.

11. *Sanitary Board.*—Want of funds, we regret to observe, had prevented the appointment of a special Sanitary Engineer for the province. The Provincial Sanitary Board held two meetings during the year.

8th March 1895.

No. 5.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Burma for 1893.

1. *Registration of Births.*—There is not much in this Report on which we need comment afresh. In all such reports the two main points in regard to which evidence of progress is desired are, *first*, the registration of births and deaths as indicative of the condition of the public health during the year the history of which is being recorded, and *secondly*, the practical steps which have been taken to remedy or altogether remove existing causes of disease, especially in those localities in which the statistics show that such measures are most urgently required. In respect of both these important matters the record for 1893 shows that Burma was still very backward. In spite of the measures adopted to improve the registration the results were still unsatisfactory, though with paid registrars in the municipal towns and police agency in the rural tracts some slight advance had been made. The vaccinators have also rendered valuable assistance, but the degree to which registration had been neglected is strikingly illustrated by the fact that of 2,869 births registered in the town of Rangoon during the year, no less than 1,804 would have been unrecorded had the vaccinators not brought them to light. The test circles, which we feared would prove a failure, have not yielded results such as were expected, and we believe it would be better to give them up and devote more and more attention to the improvement of registration in all the circles of the province. The birth-rate of

26·03 in 1893, although higher than any previously recorded in Lower Burma, is still very low, and an examination of the details given in Form I. shows of what varying elements this provincial average is made up. In individual circles the rate ranges between 6 and 77, both of them very improbable ratios, while if we take the proportion of male to female births as a test of accuracy, we find that although the males average as a whole only 108 to every 100 females, this is the outcome of 20 cases in which the female births exceed the male births—in some of them to a considerable extent, overbalanced by the great number in which the male births are in excess, in proportions varying between 101 and 173. We note that in the Pyinwa circle of the Akyab district no births whatever were registered, nor are any deaths given for this circle in Form II. Of these blanks we can find no explanation. The Sanitary Commissioner has already drawn attention to the low birth-rate registered in the towns, which is not to be wholly explained by the preponderance of males, which is so marked in many of them. It would facilitate comparison of the various circles if one serial number were given throughout for the whole 120 circles. In the forms as they now stand the numbering is by districts, and no object seems to be gained by this arrangement.

2. *Deaths.*—The deaths were somewhat more numerous than in the previous year, raising the mortality per 1,000 from 20 to 21·75. This result is to be accounted for mainly by an increase in small-pox and fevers, but there was also a rise under the other heads, with the exception of cholera and of dysentery and diarrhœa. In accordance with the orders of the Government of India, a statement is given comparing the meteorology and the market prices of the more common grains during 1893 with each of the previous six years in seven different districts, but, as the Sanitary Commissioner observes, it would be rash to draw any definite conclusions from these figures until the mortuary registration is more accurate than it has hitherto been. As was to be anticipated, the death-rates in the circles taken individually show very marked variations. In the district of Akyab, for example, with a mean of 26·16, the circle rates range between 17 and 36 per 1,000—a contrast not by any means incredible in itself, for disease is often localised to a large extent, but rendered suspicious by the great excess of male deaths, even in places where the sexes are pretty evenly balanced. We might cite many other examples of a like kind, and others in which it would appear that many deaths must have occurred which have not been entered on the register.

3. *Sanitary defects.*—The latter part of Form II. is designed to give information regarding the chief sanitary defects which exist in each circle. Orders for this addition arrived too late to admit of its being given for 1893, and therefore the existing arrangements for drainage, water-supply, and conservancy have been shortly described without special reference to defects. Of defects, however, frequent mention is made. Of these, the most frequent and most likely to cause disease is the unprotected state of the water-supply and the special dangers to it arising from cesspools. These cesspools seem to exist nearly everywhere, and frequently in such abundance that there is one in every house. Seeing that the water is drawn mainly from wells, it is difficult to exaggerate the evil which such a system must entail. Moreover, the wells are very numerous. In the town of Tavoy, for instance, where it is said the "cesspits exist in every part of the town," there are 386 wells, so that here, and no doubt it is the same in many other places, the site is honeycombed with alternate wells and cesspools. We observe, also, that when old cesspools fill up, new ones are sometimes sunk, in other places they are closed and latrines provided in their stead. It will take a long time to do away with the evil effects of the cesspools, but the first step in this direction should be to prevent the making of any new ones.

4. *Receipts and expenditure on Conservancy.*—Form No. II. now contains two columns to show respectively "the net receipts from conservancy" and the "net expenditure on conservancy" in each circle. With few exceptions the entries of these columns are confined to towns; as regards other circles they present blanks. As regards expenditure, the sums spent by the various municipalities are very various. At Lemyethna and Myanaung the populations are much the same, but the one municipality spent only Rs. 820 and the other Rs. 2,145. At Maubin, again, with a similar number of inhabitants, the expenditure was Rs. 2,898. Under the head of receipts from conservancy there are very few entries, and some of them are of large amounts—such, for instance, as Rs. 1,56,997 at Rangoon, where the receipts exceeded the expenditure on conservancy, Rs. 5,611 at Yandoon, Rs. 1,19,898 at Moulmein, and Rs. 13,391 at Thaton. It would be interesting to know by what means such large sums were obtained. We presume that the intention of the Government of India was that this receipt column should be confined to such items as the profit derived from sewage farms or the sale of town sweepings or of manure. Some explanation is the more necessary because some even of the large towns show no receipts from conservancy.

5. *History of the Chief Diseases: Cholera.*—The main facts in the history of cholera during the year are, *first*, that the disease was present over great part of the province—of the 120 registering circles 71 returned deaths due to this cause. The results are detailed by circles in Form II. and are summarized in Form VII., which deals specially with this disease. We may note in passing that there is a slight discrepancy in these statistics as to the number of registering circles, for whereas in No. II. the total is 120, in No. VII. and the others which follow it regarding other special diseases the total is only 118. *Secondly*, although so widely present the disease was much less prevalent than it had been in 1892, causing only 2,393 deaths compared with 6,208. During the 22 years of which statistics are given, the annual number of deaths has varied between 640 and 15,982. *Thirdly*, the violence of the disease was confined to a few places. It was only in two of the districts, Prome and Thayetmyo, that the cholera death-rate exceeded 1 per 1,000. In the former it equalled 2·05, but this was mainly due to outbreaks in the town of Prome and in the rural circles of Mahathaman, Padaung, and Paungde. Two of the circles of this district entirely escaped. In the district of

Thayetmyo the death-rate of 1·41 was contributed mainly by two of the towns. *Fourthly*, the great mass of the villages escaped. Out of a total of 17,414 in the province, only 547 recorded deaths from cholera. Even in the two districts above named, in both of which there were centres of considerable cholera prevalence, the proportion of villages attacked was only a fraction of the total—178 out of 1,744 in Prome and 34 out of 737 in Thayetmyo. *Fifthly*, the disease did not observe the course according to season, which is usually followed in Burma. Ordinarily it increases in the hot dry months till the rains, and then diminishes, but in 1893 it increased with the rains and did not abate in the closing months of the year in the same proportion as is commonly seen. *Sixthly*, one chief feature was its "endemicity amongst insanitary surroundings." Such facts are not new, either in Burma or in other parts of India, but they deserve prominent notice, especially at a time when theories are so persistently put forward to account for the disease which take little account of such facts. The statistics of cholera in Burma, in common with all the other statistics relating to both births and deaths, refer only to the lower part of the province. It may be too early to expect such statistics regarding Upper Burma, but much useful and interesting information, especially as regards epidemic disease, might be collected by the Civil Surgeons and summarized in the annual Sanitary Report.

6. *Small-pox and Vaccination.*—The experience of the province in respect of small-pox was less favourable than in the previous year, for the deaths recorded under this head numbered 3,081 in place of 1,463, but there was no outbreak of any severity except in Akyab, where the death-rate under this head equalled 3·68 per 1,000, the provincial average being ·68. In all the circles of the district this average rate was exceeded, and in several of them the excess was great. In the first five of them which are entered in Form II., the small-pox mortality ranged between 4·06 and 9·72 per 1,000. In looking at the statistics of vaccination, the chief points which attract attention are the contrasts presented in different districts as regards the amount of work done by each vaccinator, the percentage of success, and the proportion per 1,000 of the population returned as protected. Omitting Akyab, where the prevalence of small-pox, strange to say, is reported to have been an obstacle to the proper working of the department, the average number of persons vaccinated by each vaccinator varied between 966 and 10,032. In this last case the vaccinator, we note, had some assistance, but the contrast, even after taking this into account, is very marked. In primary operations the percentage of success varied between 76·80 and 96·40. In re-vaccinations it was between only 1·06 and 90·91. In column 16, which shows the number of persons successfully vaccinated in 1893–94 per 1,000 of population, the district ratios, again omitting Akyab, vary between 4·35 and 102·23. These are the figures for Lower Burma. For Upper Burma also the table shows great differences, though not so marked as those of Lower Burma. The Chief Commissioner, in his orders on the Vaccination Report, has already noticed some of these contrasts, and has inculcated the great need for more inspections of the work done, especially by the Civil Surgeons. So far as the evidence goes, vaccination has not exercised that influence on small-pox in Burma which might be expected. There has been a large increase in the successful vaccinations recorded from year to year. In the year 1884–85 the total was only 70,505, whereas in 1893–94 it had gradually risen to 123,445, but we find that the deaths recorded as due to small-pox in 1885 were less than they were in 1893. The comparison of one year with another year, taken singly, is not sufficient basis for drawing safe inferences. The results should be carefully examined for a series of years, and this is the most important question with which the Sanitary Commissioner has to deal, as head also of the vaccination staff—what effect have the successful vaccinations reported during a series of years had on the prevalence of small-pox in different localities? If the evidence on this point is not decisive in favour of vaccination, all the records of the number of operations annually performed and the high percentages of success are of but small value.

7. *Fevers and other diseases.*—Little is said in the Report of fevers and the other great heads under which deaths were registered, but fevers as usual account for the great bulk of the mortality. Of the total of 21·75, fevers contributed 11·22, the district ratios varying between 5·55 and 21·38. The fever mortality was the highest recorded, but this is attributed in great measure to greater accuracy in registration, especially in the rural tracts. As regards dysentery and diarrhœa, there is nothing calling for special remark. Under no heading are there such marked contrasts as under the deaths entered under "All other causes," and these are to be found in nearly every district. In Akyab the mortality under this head has a minimum of ·49 in one circle compared with 15·26 in another. In Kyanpyu the extremes are ·04 and 12·13. In two of the Prome circles no deaths appear under this head; in one of the towns they equalled 18·67 per 1,000, and so on with many other examples that might be given. Such defects must be expected where the recording agency is so imperfect. It is necessary, however, to bear them in mind, especially in considering the deaths put down as due to fevers, for what is entered as fever in one place is evidently recorded under "All other causes" in other places, and *vice versa*.

8. *Sanitary works.*—As already remarked, not much progress was made during the year in the way of sanitary improvements. From the tabular statements we learn that in Lower Burma Rs. 37,094 were spent by the Public Works Department on original works and Rs. 4,788 on repairs, and that in Upper Burma the figures under these two heads were Rs. 34,457 and Rs. 4,984, the totals for the whole province being only Rs. 71,551 and Rs. 9,772. The detailed statement shows that these sums were devoted to minor works, such as the construction of wells and latrines. The Chief Commissioner, in noting the incompleteness of the information given regarding the disposal of the money derived from the municipal and district funds, observes that municipal sanitation will be more conveniently dealt with when the municipal reports are considered. It is very desirable that

the Sanitary Commissioner should embody the latest orders on this important matter in his annual Report. In the town of Rangoon two works of some magnitude were in progress, one to improve the water-supply, and the other to reclaim low-lying land to the east of the city. In Moulmein and Prome cesspits had been closed and measures taken to introduce a good system of conservancy. At Akyab similar steps were in course of being adopted. The authorities are fully alive to the benefits to be derived from sanitary works, but, as in other provinces of India, want of funds is a serious obstacle to such schemes being carried into effect. The question of rural sanitation was engaging attention, and it was hoped that some simple rules in regard to it would soon be issued.

9. *Sanitary Board.*—The change in the constitution of the Sanitary Board which had been foreshadowed in the previous year was carried out. The Financial Commissioner was relieved of his duties as President of the Board, and his place taken by the Sanitary Commissioner. The work of the Board during the year seems to have been confined to correspondence regarding the provision of survey maps of a few selected towns.

8th March 1895.

No. 6.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of the Central Provinces for 1893.

Examination of Registration Circles desirable.—This Report contains much useful and valuable information, but there are several important matters in regard to which details are desirable. In the tables of statistics which are appended to it, and which under recent orders of the Government of India have been rendered more full than they were previously, data have been given for each registration circle, and not merely for each district as a whole, but in his analysis of these statistics of births and deaths the Sanitary Commissioner has confined himself to a comparison of the districts only, and has not analysed the registration circle details. It is very important that this should be done in the body of the Report, so that any marked discrepancies in the details, or any other indications of error or omission apparent may be brought to notice. It is true, as the Sanitary Commissioner observes in paragraph 54, that no comparison of these details can be made for 1893 with those of other years, because these details are given for the first time in this Report for 1893, but though the comparison cannot be made with other years a valuable check may be exercised over the returns by comparing the results in different places, and more especially in neighbouring places.

2. *Registration of Births.*—If we carry out such an analysis in respect of births we find that there are some points which deserve notice. As a whole the births registered throughout the Province yield an average of 38·23 per 1,000, a comparatively low ratio compared with the results of other years in this part of India. The district ratios which make up this general average range between 33·29 in Wardha, and 47·64 in Nimar. Again, if we compare the "number of males born to every "100 females born" the provincial average is 106·65, the mean district ratios varying from 102·75 in Mandla to 111·08 in Nagpur. The returns from individual registration circles, as was to be expected, yield much greater extremes. We may instance a few of these under both of the heads above noted.

District.	Maximum and Minimum Birth-rate in the Circles of each District.		Maximum and Minimum Percentage of Male to Female Births.	
	Maximum.	Minimum.	Maximxm.	Minimum.
Damoh	60·77	40·85	125	100
Jubbulpore	53·66	33·00	116	93
Narsinghpur	67·20	28·76	124	97
Hoshangabad	51·25	18·07	152	83
Nimar	91·70	30·15	120	95
Balaghat	46·33	29·58	117	102
Nagpur	58·73	26·01	129	95
Wardha	43·41	23·07	121	82
Raipur	61·09	17·69	153	96
Bilaspur	42·00	13·75	155	88

We have not included Burhanpur in the above, because, judging from the other figures concerning it, the proportion of male to female births, given as 203·37, seems to be a clerical error. In some few of the circles referred to the comparatively small population may to some extent explain the results, and other causes no doubt come into operation which materially affect the birth-rate, but what we wish to point out is that in order to improve the registration it is not sufficient to consider the district averages. It is essential to look at the items of which these averages are composed, and to institute a local inquiry whenever the character of these items throws a doubt on their accuracy.

3. *Measures for improving Registration.*—Another point connected with registration, and more especially the registration of births, is the low figures for towns as compared with rural areas. There seems no other way of accounting for this result, which is not confined to the Central Provinces, or to one year's experience, than by imperfection in the registration, and that, too, although the system is nominally compulsory, and breaches of the byelaw are punishable, and in many towns actually punished by fines. We have long remarked the want of any uniform practice in regard to the levy of these fines, and have doubted their efficacy in the manner in which they have been applied. We therefore welcome the remarks of the Chief Commissioner on this subject, which are contained in paragraph 2 of the orders of the Local Government. Nothing is said of inspections of the registration records by superior officers, such as the Sanitary Commissioner himself, or the Civil Surgeons, or others whose duties call them frequently on tour, all of whom might render valuable assistance in improviug the returns. In paragraph 56 a statement is given showing "the "discrepancies made out by the native Superintendents of Vaccination in checking vital statistics "reported by kotwars and recorded by the police," but it is not very clear how the figures are to be interpreted. It is said that they cannot be relied on, and therefore no comment is made on them. The Sanitary Commissioner has been asked to explain his reason for coming to this conclusion, and nothing further need be said on the subject at present. It is very desirable that full inquiry should be made, and that the aid of the Vaccination Superintendents, which promised very useful results, should not be set aside without an earnest endeavour to turn it to good account.

4. *Registration in relation to the Census.*—We have frequently drawn attention to the value of the recurring censuses as a means of checking the registration in the intermediate years. In our memorandum on the Report of the Sanitary Commissioner of the Central Provinces for 1892 we remarked that more information was desirable under this head as respects the Census of 1891. We can find no reference to the matter in this Report for 1893, but in the orders of the Chief Commissioner upon it we note that the Government of India has "examined the accuracy of the vital statistics in the light of the "information by the last census," and that judged by this test the returns of the Central Provinces are found the second best in India. We have not had the opportunity of seeing this important resolution. Such a paper might with great advantage have been appended to the Sanitary Report or the main facts concerning the Central Provinces embodied in the Report. All such facts must be full of interest for the District Officers and Civil Surgeons and all others who have to do with the registration and could not fail to aid in its improvement.* The compilation of the vital statistics of each district, which was formerly made by the Superintendents of Police, has no wbeen entrusted to the Civil Surgeons, as has long been done in the North-west Provinces and the Punjab.

5. *Registration of Deaths.*—As a whole the year was remarkably healthy. The provincial death-rate equalled only 27·70—a lower ratio than that of any year since 1884, when it stood at nearly the same figure as in 1893. In one of the intermediate years (1889) it had been as high as 43·79. In his remarks on the distribution of the deaths the Sanitary Commissioner has confined himself to the district ratios and to the general results in the larger towns. It is well, however, to examine the facts somewhat more closely, and this we have the means of doing by looking at the details of Form II., in which the deaths and causes of deaths are given for each registration circle. The district rates vary from 22·98 in Sumbalpur to 33·73 in Narsinghpur, but in nearly all the districts there are marked differences in the returns of the registration circles of which they are composed, not only as regards the registered mortality, but also as regards the proportion of this mortality assigned to each sex. We may cite a few examples:—

Name of District.	Average Death-rate in District.	Registration Circles.		Percentage of Male to Female Deaths.	
		Maximum.	Minimum.	Maximum.	Maximum.
Saugor	29·82	37·71	14·24	130	109
Damoh	29·83	44·58	25·29	137	102
Jubbulpore	30·87	36·56	23·74	134	97
Narsinghpur	33·73	61·19	23·82	128	112
Hoshangabad	28·44	34·66	14·10	200	99
Nimar	32·19	75·33	18·22	215	112
Nagpore	25·78	48·68	15·87	136	99
Chanda	27·90	38·07	19·67	169	102

Extremes in the death-rates are to be expected, but it is important that they should be noted, so that any unusual mortality may be made the subject of local investigation. On the other hand, such disproportions between the death-rates among males and females as are here manifested are evidence of imperfect registration.

6. *Meteorology and Food Supply.*—In connexion with the healthy character of the year and the reduced death-rate information as to the meteorology and food supply of the people is important. In only three of the districts (Damoh, Chhindwara, and Chanda) did the people suffer from scarcity and even in them they did not suffer in any marked degree. In illustration of the main features in

* The resolution in question reached the Army Sanitary Commission after this Memorandum had been drawn up and put in type.

the meteorology of the year charts are given showing the temperature and humidity in five districts as compared with the mean of the previous five years, and other charts are added to show the monthly rainfall in each district side by side with the mean of the previous 27 years. In paragraph 48 there is the prescribed statement containing the mortuary and meteorological statistics of five selected districts, together with the prices of food grains in each over a series of years, but no comment is made on the figures which this statement contains. It would be more convenient if all the information on meteorology and food supply were brought together and fully considered in one part of the Report. The charts would also be more instructive if all the data regarding a district were entered on one chart instead of being spread over several. We are, moreover, of opinion that the comparison of any year with its predecessors would be much more valuable if the facts of those years were stated not in means, but in actuals for these years so far as this can be done. It would not be convenient to attempt to give the actuals for each year separately, but a maximum and minimum line during the period with which comparison is made would be much more valuable as affording data for forming conclusions than the mean for that period. In India where individual years differ so widely in their healthiness, their rainfall, and all other characters, the means are of little or no value.

7. *History of the Chief Diseases: Cholera.*—As may be seen very clearly in the table contained in paragraph 12 of the Report, the year 1893 was not only one of reduced mortality as compared with 1892, but also one in which the reduced mortality was marked under every head except small-pox. The reduction under cholera is very striking, for the deaths due to this disease fell from 39,972 to 557 and the mortality from 4·21 per 1,000 to 0·06. The year 1893 was in fact one of remarkable abeyance of cholera in the Central Provinces. With the single exception of 1884 it caused a smaller loss of life than in any one of the previous 15 years. In 9 out of the 20 districts no death was attributed to it, and in every one of those affected, with the single exception of Chhindwara, the mortality from it was much under what it had been in the year previous. The district sanitary reports which are submitted by the Civil Surgeons and are quoted by the Sanitary Commissioner throw no light on the cause of the disease. In several of them its appearance is attributed to pilgrims coming from Puri in Bengal or Pandharpur in the Bombay Presidency, but the evidence in all the instances referred to is most meagre, and is contradicted by the general history of the year. For example, in the Chhindwara Report it is said that the first case was a pilgrim who "halted at a "well near a Bania's shop, and it was this Bania who was the first victim of cholera in early August. "Thus, the disease spread by direct communication." No dates are given nor is the nature of the direct communication described. But if one pilgrim suffering from cholera is sufficient to account for this outbreak in the Chhindwara district to which 112 deaths were due, it is very remarkable that although the disease was present in the district for nearly five months it was so limited in its extent, for we learn that of 1,308 villages in the district only 13 were attacked during all that time. Similar examples might be taken from other districts. The cholera problem is far more difficult of solution than these district reports would have us believe, and it cannot be too strongly impressed on all concerned that the only way of dealing with it which can ever yield satisfactory results is to collect the facts year by year accurately and in the fullest detail, especially as regards the history of first cases, and to draw no conclusions which these facts do not warrant.

8. *Discrepancy in Circles, &c.*—We may note in passing that there are discrepancies in the number of circles, and in the distribution of cholera and other diseases which we are unable to reconcile. In the general Statistical Tables Nos. I. and II., the number of circles is entered as 232, whereas in Nos. VII. to X. this number is given as only 160. In No. II. again the number of these circles returning deaths from cholera is 30, and the number returning deaths from small-pox, 114, whereas the numbers returning deaths from these diseases according to Table No. II. are only 26 and 82. The registration circles, being the units on which all the returns are based, should present the same total in all the tables. We would suggest further that the statements appearing in paragraphs 44 and 47 might be omitted in future reports. The first of these relates to the proportion of the deaths to be ascribed to the chief diseases as investigated in a certain number of cases by the Civil Surgeons and the Police; but as we have already explained in a former memorandum, this is a subject on which the Police cannot be expected to render any useful help. The second of the statements to which we refer is merely a repetition of what is already given more fully in Annual Form No. II.

9. *Small-pox and Vaccination.*—As has been already mentioned, small-pox is the only heading under which the mortality of 1893 exceeded that of 1892, but there was no outbreak of consequence in any part of the province. The average death-rate from this cause was only 0·17 per 1,000, although in 114 circles out of the 232 recorded in Form II. fatal cases occurred. In very few of them did the mortality amount to 1 per 1,000. The maximum 2·18 occurred in the rural circle of Sironcha. The facts generally afford continued evidence of the influence of vaccination in restraining small-pox, especially of recent years. The working of the Vaccination Department, as detailed in the special Report for 1893–94, was hardly so successful as in the year previous, because, although there was a slight increase in the total number of operations performed, this increase was due to the larger number of re-vaccinations; the number of primary vaccinations had fallen off to a considerable extent. This falling off is attributed among other causes to "the unhealthiness of the year," but this remark does not accord with the general sanitary history of 1893, as already recorded. It may be that the early months of 1894 were unhealthy, but of this no special mention is made. The total births registered in 1893 was 363,209, and the number of infants under one year successfully vaccinated amounted to 237,904, plus 9,953 credited to the dispensaries. Deducting the deaths

among such infants there still remains a considerable balance to be accounted for. A careful comparison of the births and primary vaccinations in every district, and as far as possible in each registration circle, should be a prominent feature in all vaccination reports. The success claimed for primary cases (95·48) is satisfactory, but 79·87, although lower than that of the year previous is far too high for re-vaccinations. We would suggest that a special inquiry should be made into this very high percentage, which betokens either great inaccuracy in the returns or very imperfect primary vaccination. In the neighbouring province of Berar the success in re-vaccination in 1893–94 was returned as 21·2 per cent., and this is much nearer what it ought to be.

10. *Sanitary Defects and Improvements.*—In that part of the Report which deals with cholera, instances are given of insanitary conditions prevailing in the places attacked. In the district of Chhindwara it is said that "the sanitary condition of almost all the villages attacked was reported to be bad," and if we turn to the latter columns of Form II. we find that such evils are very common. In many cases the information given is scanty, but enough is said to show that there is great need for improvement. The remarks in the last column of this form affords ample evidence that this important matter is not being neglected. Frequent mention is made of large sums having been sanctioned for deepening and cleaning old wells, sinking new ones, clearing village sites, and other sanitary works. As regards larger works, it is reported that the new water-supply at Raipur is much appreciated by the inhabitants, and other municipalities have evinced a desire to be provided with a similar boon.

11. *The Sanitary Board.*—The constitution of this Board was being revised and fresh rules were being framed for the conduct of its business. In Appendix I. a *resumé* is given of their proceedings during the year. They related chiefly to the assignment of the grants-in-aid for village improvements, to determining the nature of these improvements which should be effected, and to ascertaining how far they had been carried out. Much good work seems to have been done.

8th March 1895.

No. 7.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Assam for the year 1893.

1. *Births and Deaths compared with the Census Returns.*—This Report gives an interesting account of the state of sanitary affairs in the province, and it has been fully reviewed in the orders of the Chief Commissioner which are appended to it. Both the Report and the Orders upon it show that sanitary matters were receiving much attention, and that they were being dealt with in a sound practical manner. Progress is, no doubt, very slow, but the difficulties are great, especially in everything that involves expenditure of money, as the financial condition of the province precluded the possibility of the Government aiding local bodies to the extent desired. There are, however, some steps towards improvement which can be taken at little or no extra cost. Among these the most important concerns the registration of births and deaths. In spite of the many efforts which have been made to render the registration more accurate, the results are by no means satisfactory. The general conclusions at which the Chief Commissioner has arrived are that "nearly two out of every "five births which occur in the province still remain unregistered," and that "at least one death in "every four which occur in this province remains unregistered." These conclusions are based on calculations which seem to show that the true birth-rate of Assam is 48 per 1,000 per annum, and the average death-rate 42. The comparison which the Sanitary Commissioner makes of the registration statistics for the 10 years, 1882 to 1891, places both births and deaths at an average annual ratio of only 28 per 1,000, with a small difference in the decimal figures in favour of births, which yield a net increase of population during that period of only 113, whereas the census of 1891 gives an increase of 494,125. As the Chief Commissioner points out, the account has not been credited in this statement with the large annual immigration which takes place every year into Assam from Bengal and other provinces, but from what has been already said it is evident that during the period in question a large proportion both of births and deaths have escaped registration.

2. *Births in* 1893.—The births recorded in 1893 yield an average ratio of 30·15 per 1,000, the district ratios varying between 21 in Nowgong and 36 in Goalpara. These and other district rates are discussed in paragraph 3 of the Sanitary Commissioner's Report, and reference is made further on to the rates recorded in the smaller areas, but a more minute examination of the results by circles of registration is desirable. This may be done by examining the figures contained in Form No. I., where the births registered in each of the 77 circles of the province are entered separately. It will be well to take a few of the districts by way of example. In the district of Cachar the range in the circles is from 18·21 in the town of Silchar to 37·67 in the rural circle of Katigora. In the town of Silchar and also in some of the other circles the female population is relatively small, in Silchar there were only 1,795 females to 5,728 males, and in the Katigora circle, which, as already stated, returns the highest ratio among the circles of the district, the male and female population are more evenly balanced than in any of the other circles. This is so far satisfactory, but in the next district, Sylhet, there are instances where, without sufficient disparity in the sexes to account for it, the birth-rate is very low—notably in the town of Sylhet, where it equalled only 14·97. In the rural circle of Sylhet

it was 41·77. In Dhubri, with a small proportion of females, the rate was only 10·98; in Salmara rural circle it was 43·03, but here the sexes were nearly equal in numbers. In the rural circle of Mangaldai, with the sexes almost evenly divided, the births registered were only 19·77 per 1,000. Many other examples of defective registration might be cited, but it is not necessary to enter into further details. What we wish to emphasize is the importance of looking not only at the averages of districts, but also at the circle ratios of which each of these averages is made up. It is only by keeping an eye on these circle returns and dealing with each individually that improvement can be effected in the general results. The statistics of the tea-gardens in several districts bear evidence of neglect, as indicated not only by a low birth-rate, but also by the great excess of male over female births In those of the Goalpara district, which furnishes the most striking example, the births equalled only 12·61 per 1,000, and of these only 1·80 per 1,000 were girls.

3. *Deaths in* 1893.—A similar examination of Annual Form II. in respect of the deaths also shows in the same way the great importance of taking the results circle by circle. For the province as a whole the mortality registered yields a ratio of 30·28 per 1,000, and the district ratios vary between 19·50 in the hills and 41·93 in Nowgong, but the circle ratios have a much wider range. In two of them the death-rate exceeded 71, in several others it neared or exceeded 60, while in others again it was very low, being under 20 per 1,000. The minimum of 10 was recorded in the town of Shillong. Form No. II., as now amended, shows not only the deaths for the year but also describes the local conditions of the different circles, and we may glance at a few of those in which a heavy mortality occurred. In the town of Hailakandi, in the Cachar district, the deaths equalled 63 per 1,000, but there is a want of definite information as to the defects to which this high mortality would seem to be due. Some improvement had been made in the drainage, but in regard to both water-supply and conservancy all that is said is that they remained as in the previous year. It would be well, even if it involved much repetition, to state clearly year after year what are the local causes of disease, so that prominent attention may be drawn to them with a view to their removal. In the Darrang district two towns record a very heavy death-rate; Mangaldai 60, and Tezpur 71 per 1,000. In both, under drainage defects, the entry is *nil*, but it is not clear whether this means that there are no defects under this head, or that there is no drainage. In both the water would seem to be impure, though it is only with reference to Mangaldai that a definite statement is made to this effect. In Golaghat rural circle, with the high death rate of 71, the drainage is described as "indifferent," the water-supply is said to be "fair," and the conservancy "requires improvement." We have cited these examples because we attach very great importance to the careful preparation of this form. It cannot be too strongly impressed on the sanitary and other authorities of every province that the great work to be done is to discover in every locality, and especially in those where there has been great mortality, what are the causes of the sickness to which the mortality has been due. This is the first step towards improvement. We are glad to observe that the Civil Surgeons have been called on to report year after year on "the local causes of disease in each locality, as well as the measures taken to "remove them."

4. *Measures for Improving the Registration.*—Measures for attaining greater accuracy in the registration of births and deaths continued to engage attention. As the Chief Commissioner observes, "unless heads of districts and sub-divisional officers give their personal attention to the work, no "reliable results can be expected," and orders have accordingly been issued requiring these officers to examine and review the statistics furnished to them every quarter, and to make local inquiry wherever there is reason to believe that the figures are defective. These instructions, so far, had been applied only to the Assam Valley districts, but their extension to those of the Surma Valley was to be considered. A copy of these instructions might appropriately have been appended to the Sanitary Report, which, as we have before remarked, should be the repository of all that concerns sanitary matters in the province. Copy of all Acts and Orders bearing on them should therefore find a place in it.

5. *History of the Chief Diseases: Cholera.*—As regards the deaths of the year the principal points to be noted, as compared with 1892, are that there was little change in the number attributed to cholera. Under small-pox there was a considerable increase, and under fevers a large reduction. As in 1892, cholera was prevalent. The Sanitary Commissioner quotes the Civil Surgeon's opinion that the disease was carried in Cachar "by boats bringing rice to the local bazaars and tea-gardens, "the bazaars becoming centres from which the disease rapidly spread," and that "the unusually dry "and hot weather in the earlier part of the year favoured the multiplication of the cholera bacillus "in the half-dried and unclean tanks and streams in which cholera-infected clothes are washed, and "which are open to every other kind of contamination, while the floods which followed no doubt "spread the germs all over the country, carrying them even to small villages which might otherwise "have escaped." These views may be quite correct, but we do not find any evidence advanced in support of them; on the contrary we find that, although cholera was present in Cachar during every month of the year, and in some months was very prevalent, 139 villages, out of the total of 341 in the district, recorded no deaths from the disease. In the neighbouring district of Sylhet, where the cholera death-rate also was high (4·87 compared with 6·89 in Cachar), only 1,505 villages returned such deaths out of a total of 5,616. In Sylhet the high mortality from cholera was attributed by the Civil Surgeon to the "universal use of bad drinking water," and, from the description of Cachar the unclean water had doubtless much to say to the cholera prevalence in that district also. The great importance of pure water, as a means of preventing cholera, is recognized by all, no matter what their views may be on the causation of the disease. The authorities are fully alive to it, but the Chief Commissioner observes that "the problem how this pure water-supply is to be provided all over the

" province still remains for solution." It can only be done in detail, by taking the more important towns first and using their experience as a lever for pushing on similar reforms in others. Much also may be done, and we believe is being done, to protect village wells from contamination. We are, however, much disappointed to find that the history of the town of Gauhati, in respect of cholera, is so unfavourable. This is one of the only two places in the province which have been provided with waterworks, but the deaths from cholera here in 1893 equalled 3·7 per 1,000, a higher ratio than in any other circle of the Kamrup district. In 1892 it was 11·56. It may be, and probably is, the case that the great bulk of the attacks were in new arrivals, and therefore not fairly to be ascribed to the local conditions of Gauhati. For the credit of the town, and especially of the new water-supply, this is a point which deserves attention.

6. *Small-pox and Vaccination.*—Although small-pox was not generally prevalent in Assam during 1893, it was very common in the district of Goalpara, where the deaths from this cause numbered 2,083. In the previous year they had been only 149. With the exception of Goalpara nearly all the districts show a diminution of this disease in 1893 when compared with 1892, but the excessive mortality in Goalpara is sufficient to raise the provincial total from 1,452 in the one year, to 2,643 in the other. On referring to Annual Form No. II., we find that the outbreak was chiefly localized in two of the seven circles, in one of which the small-pox mortality equalled 6·00 per 1,000 and in the other 4·98. In two of the circles of this district no death from this cause was reported, and in the remaining two it equalled 1·99 in the one and only 0·04 in the other. The Sanitary Commissioner mentions that the disease was chiefly prevalent in Bijni Sidli and the Eastern Duars, where the people persistently refuse vaccination, but as none of these names appear in Form II. it is not possible for us to examine the actual figures or compare them with the vaccination returns. When local outbreaks of small-pox occur, and especially when they are so severe as they were in certain parts of the Goalpara district during 1893, it is very important that the facts should be carefully examined in connection with the statistics of vaccination in the same localities during a series of years. The vaccination work of 1893–94, of which a separate report is furnished, was not satisfactory. The early supplies of lymph failed, and, chiefly in consequence of this, the year's return fell short of that of the year previous. This is especially the case with respect to the number of children successfully vaccinated, which fell short of the record of 1892–93 by no less than 32,112 of the total registered births of the year; and, as has been already shown, very many of the births fail to be registered. Only 24·51 per cent. were reported as having been protected from small-pox. The benefits derived from vaccination are much less marked in Assam than in many of the other provinces, yet there has been a very large extension of vaccination in Assam of recent years. In 1884–85 the number of persons successfully operated on was returned as only 92,400, whereas in this last year 1893–94, even with the falling-off already referred to, the number was 171,146, or nearly double, but the diagram designed to show the relation between successful vaccination and immunity from small-pox brings out, as the Sanitary Commissioner himself observes, "little relation "between the two." In looking at the statements appended to the Vaccination Report there are several points which deserve attention. First, there is the remarkable difference in the amount of work done by the vaccinators in different districts. The general average, 849 for each vaccinator, is small, but this is made up of great extremes. Such extremes are to be expected, perhaps, among the licensed vaccinators, but they occur also among the paid men. Then, again, the percentage of success in primary cases, 86·4, is low, and is made up of very varying district ratios, falling in one instance so low as 62·85. On the other hand, the success claimed in re-vaccination, 78·05 per cent., is not to be credited. Either the returns are untrustworthy or the primary vaccination in these cases must, to a large extent, have been imperfect. In the district of Manipur, where nearly 9,000 persons were operated on during the year, the success claimed for re-vaccinations, 98·22, is considerably higher than that claimed for primary cases, 86·77. There is no branch of sanitary work that requires more constant and careful supervision than vaccination, and this can be affected only by frequent inspection on the part of the controlling officers. The Chief Commissioner, we are glad to observe, has inculcated on Civil Surgeons the need for greater attention to this important part of their work.

7. *Fevers and Kala-azar.*—The fever mortality in 1893 had reverted to what appears to be the ordinary rate for the province. The exact ratio for the year is 15·42; in 1892 it was 18·72. The same districts suffered most in both years, and the disease is attributed with reason to the flooding of low lands by the overflow of the Brahmaputra river. The rainfall over the valley in 1893 was much under what it had been in 1892, and hence this evil was less than in the previous year. Dr. Warburton gives an interesting and instructive account of his inquiries into *kala-azar* in the Nowgong district, where it raged with great virulence in 1893. The most important conclusions at which he has arrived are:—1st, that the *Dochmius duodenalis* is not by any means a constant feature in the disease; 2nd, that it cannot, therefore, be regarded as its cause; 3rd, that kala-azar is often undistinguishable from malarial fever, and appears to depend so much on the same causes that, "if "malarial conditions could be completely removed, it would cease to exist"; 4th, that the remedy is to be found in improved sanitation. These conclusions are all confirmatory of the views we have expressed in noting on kala-azar since the subject first attracted attention. On one point Dr. Warburton's remarks seem to be somewhat contradictory. In one place he says, "the sufferers "may convey the disease to a fellow-caste village some distance off," whereas in a subsequent part of the same paragraph (35) this passage occurs:—"If it were an infectious disease caused by personal "contact, Shillong, for example, to which numbers of people from the *kala-azar* districts have "resorted for years, could not have escaped, and instead of creeping along at the rate of a few "miles in the year numerous centres would long since have appeared all over the Assam

" valley." This history seems conclusively to show that *kala-azar* is due not to infection but to local conditions. If there are any supposed instances of the disease being communicated by sick persons to localities which had not previously suffered from it, they should be carefully investigated.

8. *Sanitary Improvements.*—No great works were executed during the year, but steps have been taken towards providing the town of Sylhet with a good water-supply. The Sanitary Commissioner remarks that, though very few large works of a sanitary kind have as yet been carried out in the province, much has been done during the past and previous years to improve the water-supply, drainage, and conservancy of the towns, and, we are glad to note, that this statement entirely agrees with what the Chief Commisioner has himself observed on his tours. As regards the improvement of villages, it appears that this matter is dealt with in the Report on the working of Local Boards, and reference is made to the Chief Commissioner's orders on that Report for 1892–93 for an account of what was done under this head in that year. On such an important point the annual Sanitary Report should contain full information, and we would therefore suggest that in future the Sanitary Commissioner should give a brief summary of the latest Local Board's Report available, and also of the orders of the Chief Commissioner upon it.

9. *Sanitary Board.*—Some account of the working of the Sanitary Board during the year is given in Appendix B. No formal meetings were held, but all important papers were circulated for opinion and for such suggestions as appeared necessary. In nearly all the districts certain sums of money were placed at the disposal of the Local Boards for sanitary improvements, such as the construction of new wells, the cleaning out of tanks, and better drainage. Owing to the state of the finances the amount available for these purposes was but small.

8th March 1895.

No. 8.

Memorandum by the Army Sanitary Commission on the Rajputana Sanitary Vaccination Dispensary and Jail Report for 1893.

1. *General characters of the Year.*—This Report calls for little comment. The districts of Ajmere and Merwara, with which it is more immediately concerned, have together a much smaller population than is to be found in nearly every one of the many districts which compose the larger provinces, and although the area comprised in the Native States of Rajputana is large and contains a large population the information regarding them is necessarily imperfect. The year, moreover, was, in common with the experience of nearly the whole of India, singularly healthy, and in this respect presents a remarkable contrast to its immediate predecessor. In respect of food the people were better off, prices were lower and would have been lower still but for the damage to the crops done by rats. All over the country the rainfall was above the average. The supply of water was thus generally abundant. The only exception to this noted is the town of Beawar, where we learn from Form II. that, "owing " to the scanty rainfall, almost all the wells and *baories* dried up."

2. *Registration of Births and Deaths.*—The registration of births and deaths, both in British territory and in the Native States, continued to be very imperfect. In the former there was some improvement in the birth-rate, which advanced from 15·61 per 1,000 in 1892 to 23·14 in 1893, but even the larger ratio can represent only about one-half of the births which actually took place, and the details of the 23 circles in Ajmere and Merwara contain a record of extremes in the birth-rates and in the proportion of male to female births which all indicate neglect. In Ajmere the births range between 17 and 52 per 1,000 and in Merwara between 16 and 31. The percentage of male to female births is from 92 to 144 in the one, and from 105 to 155 in the other. This disproportion between the sexes is not worked out in the statistics given for the Native States, but the great variations in the birth-rates leave no doubt that, so far, little progress has been made in them towards an accurate record of such domestic occurrences. In regard to deaths it is sufficient to note that the mortality in Ajmere-Merwara had fallen from 40·80 per 1,000 in 1892 to only 23·30 in 1893, but even with this very satisfactory reduction, the recorded deaths still exceeded the recorded births by ·16 per 1,000. In the review of the Report by the Local Government, it is mentioned that, "new rules have been " framed and published within the municipal limits of Ajmere, Beawar, and Kekri for the more " accurate registration of vital statistics, and the system now in force will, it is hoped, produce better " results than have been attained hitherto." The Report also speaks of "the new arrangement for " the supervision of vital statistics," but no particulars are mentioned, and it would be well that a full account of the system now in force should be given, and any changes made from year to year recorded as they take effect. The Chief Medical Officer in Rajputana, who has drawn up the Report, calls attention to the heavy mortality among children under one year, and attributes this to the weakened condition of the population from the famine and excessive disease of the previous year. But the death-rates of 136 and 122 per 1,000 among male and female infants which were recorded in Ajmer-Merwara in 1893, although relatively high when compared with the rates at other ages, are low when compared with the infant mortality returned by those provinces and large towns of India in which registration is more accurate; and seeing this, and also the good reasons advanced for expecting many deaths among infants in Rajputana during 1893, we can only conclude that the infant mortality

registered there in that year fell far short of what actually occurred. As regards the Native States it is satisfactory to see that many of the durbars are interesting themselves in the registration of births and deaths. We fully recognise the peculiar difficulties attendant on such an undertaking in them, but with the progress of education we have little doubt that decided improvement will in time be effected.

3. *History of the Chief Diseases: Cholera.*—Even now, with all their imperfections, the statistics of Rajputana afford valuable information in respect to the history of epidemic diseases, and more especially of cholera. Rajputana generally, during 1893, enjoyed great immunity from this disease, and the contrast under this head between its experience during the year under report and that of the year previous is remarkable. The truth of the main facts, moreover, is borne out by the statistics of other provinces. In the Ajmere division in the one year the number of deaths from cholera registered was 2,352; in the other it was only 3. In the Native States the contrast lies between 26,760 and 314. In regard to the few cases which were reported in the Ajmere division and in some of the Native States during 1893, the Chief Medical Officer expresses his opinion that "many or all "these isolated cases might have been due to unwholesome food or to some local cause, and they "could not have been true cholera," but the mere fact that the cases were few in number is no "argument against their being true cholera, for the same phenomena are met with nearly every year among both troops and prisoners, where the cases are under skilled medical observation, and there is no reason whatever to doubt the accuracy of the diagnosis. It was only in the Sirohi and Dungarpur States that cholera can be said to have been epidemic during 1893.

4. *Small-pox and Vaccination.*—The vital statistics are not yet sufficiently accurate to admit of an opinion being formed as to the effect which vaccination has had on the prevalence of small-pox. In the Ajmere division, during the last ten years for which the figures are given, vaccination has made much progress, and the number of persons successfully operated on has risen from 3,367 in 1885 to 12,703 in 1891–92. In 1893–94, the year under report, the total, though falling short of this maximum, amounted to 12,085, or a percentage of 22·34 per 1,000 of the population. This is a low ratio, but what is more important is to compare the number of infants under one year successfully vaccinated with the number of registered births. The births registered, as we have already mentioned, equalled only 23·14, or about one-half of what probably took place, but even at this low rate they numbered 12,550, whereas successful vaccination reached only 7,414 of them. In regard to the Native States under this head, while only 51,432 births were registered during the year, 135,311 infants under one year were successfully vaccinated—a discrepancy which is to be explained by the fact that while the registration of births has been extended to a population of little more than 3,000,000, vaccination is carried on among a population of over 11,000,000. Strenuous exertions are needed to protect a larger proportion of the infant population. In the Ajmere division only 75 fatal cases of small-pox were recorded—a marked reduction on the 1,652 of 1892. In several of the Native States the disease was prevalent.

5. *Sanitary Progress.*—In the Ajmere division the most important fact to be recorded under the head of improvements is that the new water-supply for the town of Ajmere has proved abundant, and that the people make free use of it. For further convenience it has been determined to have it laid on to the houses. A scheme for village sanitation was under consideration. Several of the Native States are mentioned as taking much interest in sanitary affairs, more particularly Ulwar, Jeypore, and Kotah. The city of Karauli is spoken of as being in a high state of cleanliness, and "the "municipal committee there do their work in a model way."

6. *Jails.*—In regard also to the jails of the Native States, it is gratifying to note that improvement is going on. In several of them there appears to have still been dangerous overcrowding, and the average mortality of 62·28 in them, although less than that of the previous year, shows that further measures are needed to reduce sickness and death among the prisoners. The returns of the Ajmere jail show a satisfactory advance on those of 1892.

15th July 1895.

No. 9.

Memorandum by the Army Sanitary Commission on the Medical and Sanitary Report of Coorg for 1893.

1. *Vital Statistics. The Census.*—In the sanitary portion of this Report, with which we are mainly concerned, there are two points connected with the vital statistics of the province which are of more than ordinary interest. First, there is the comparison of the census figures of 1881 and 1891 with the results of the registration of births and deaths during the intervening ten years: and secondly, there are the details of the various registration circles for 1893, which are given for the first time. According to the census the population of Coorg numbered 173,055, according to the registration it should have been 169,780. Considering all the circumstances this discrepancy is not very great, but when the figures are examined according to sex they are less satisfactory, for they show a preponderence of deaths over births among females, which is improbable, and which does not accord with the census results. Looking at the births for the ten years 1881 to 1890, which are involved in the comparison with the census figures, there can be little doubt that many of them must

have been omitted in the registration. After making due allowance for the excess of males over females among the inhabitants, it is evident that a birth-rate which never exceeded 23 per 1,000 in any of the years in question must be much under the truth. Year after year the statistics have shown the very anomalous state of things under which the province has lost more by deaths than it has gained by births, and yet there is reason to believe that the deaths have been, especially in some of these years, considerably understated. It would appear, in fact, that the results of the census and of registration would not have approximated even so nearly as they have done had there not been omissions on both sides of the registration account, on both births and deaths. It would have hepled to form a more accurate opinion on these points if the question had been examined, not only for the province as a whole, but also for some of the towns and rural areas taken separately.

2. *Births.*—An examination of Form I. lends support to these remarks, for here we not only have the low birth-rate repeated—it amounted to 21·22 for 1893, but we have details of individual circles which show that the registration of births is still very defective. In these circles the rates vary between 10·59 per 1,000 and 34·81, all of them probably under the fact, and many of them palpably so. In six of the 11 circles the ratio was under 20 per 1,000, or probably less than one-half what it really was. If the results be tested by the proportion of males and females born, there is further evidence of inaccuracy. The general average for the province, 101 males to every 100 females, may be accepted as an approximation to the truth, but this average is made up of such extremes as only 93 in one circle and 242 in another. It is remarkable that the most unsatisfactory returns are made by the towns where more care might be expected. Of the five entered in the form the highest birth-rate recorded is 25·92 at Kodlipet, and the mean of the whole is only 14·50. In the rural circles the mean was 21·88. Both doubtless very defective. In only one circle did the births exceed the deaths. The difficulties connected with the registration are no doubt great, and we are glad to observe that care is being taken to render it more accurate. We would only suggest that in future the Civil Surgeon should examine carefully the returns from individual circles. A record merely of the provincial averages is of but little use in ascertaining where any neglect lies.

3. *Deaths.*—The report records that the mortality in the province during 1893 equalled 24·97 per 1,000, but here again the details as revealed in Form II. show several points which deserve attention. The general average (24·97) is made up of circle ratios varying between 17·88 and 46·32. Extremes in death-rates are to be expected, indeed anything like equality in these rates would be indicative of error rather than of accuracy, but in many circles the results bear evidence of being at least open to suspicion. As we have already said, the actual death-rate was probably much higher than it is stated to have been. The disproportion between male and female deaths greatly strengthens this suspicion. Over the province generally the proportion between the two was 131 deaths of males to every 100 deaths of females, but this is the mean of very varying figures from the separate circles which fill up the eighth column of this Form II. In one place only 52 males died to every 100 females, in another the proportion was 402 males to every 100 females. These are the extremes, but throughout all the entries there is a remarkable divergence. The form as now expanded will enable the local authorities to learn more clearly the state of the registration in every circle, to find out the defects, and then to take steps for improvement. We have already noted that the birth-rate in the towns was much less than that of the rural circles. In regard to deaths the position is reversed. The mortality in the rural circles (24·24) was much under that of the towns (32·43). It is worthy of notice also that while the province as a whole during 1893 enjoyed better health, as indicated by the death returns, than it had done in 1892, 24·97 per 1,000 as compared with 30·62, the mortality in the towns during 1893 (32·43) was higher than in the year previous (31·98). It appears, however, that the town statistics of 1892 included only Merkara, so that the comparison is incomplete. The higher ratio of 1893 may also be attributable to more accurate registration.

4. *Mode of Calculating Male and Female Deaths.*—There is a discrepancy in the calculations of the male and female rates of mortality which requires separate notice. In Form No. IV., which deals with the deaths registered according to sex at different ages, the total mortality among males is said to have averaged 25·56 and among females 24·25, and these rates seem to be correct, calculated as they should be by taking the deaths per 1,000 by sexes, the male deaths on the male population and the female deaths on the female population. But in Form II. very different results are given. There it is entered that the male mortality equalled only 14·16 and the female mortality only 10·81, the two together making up the provincial total 24·97. It would seem that here the deaths of each sex have been calculated on the *total* population of the province, and not on that of each sex taken separately. This was not done in previous reports, and it ought not to have been done now. Perhaps the error may have arisen through a misunderstanding of our remarks on the mode of calculating male and female *births* which we made in our Memorandum on the Coorg Report for 1892. In it we pointed out that the Civil Surgeon had made a mistake in deducing the rate of female births by taking the number of females born in proportion to the female population and the number of males born in proportion to the male population, and then adding the two together to ascertain the provincial birth-rate. Women are no more intimately concerned with the births of girls than with the birth of boys, just as men are no more concerned with the births of boys than of girls. Both sexes are concerned with the births, and therefore the birth-rate for boys and girls must each be calculated on the *total* population of males and females combined. But with deaths it is very different. If we wish to know the mortality in any section of the population, we must consider the deaths among that population. Therefore the mortality among males can be ascertained only by taking the number of male deaths among the male population, and the mortality of females, in like manner, by taking the number of female deaths among the female population. There is

another discrepancy also to be noted. In Forms I. and II. the number of circles of registration is 11, whereas in No. VII. and others it appears as only 6.

5. *History of the Chief Diseases.*—The year was generally healthy as compared with 1892. Under all the great heads under which deaths were registered there was a reduction in the mortality, but under "fevers," which as usual contributed by far the greatest portion of this mortality, the reduction was small. The chief points to be noted are the abeyance of cholera, from which only 9 deaths were recorded during the year. In 1892 the number was 58, and this represented a very unusual prevalence, for during the ten years 1883 to 1892 only 84 deaths in all had been registered as due to this disease. This marked immunity from cholera which Coorg enjoys is well deserving of attention. In regard to small-pox, although the reduction in the deaths was great, only 214 compared with 913 in the year previous, the mortality was much higher than in other provinces. We note that the successful vaccinations of infants (1,068)* falls far short of the registered births of the year (3,672), and as there is reason to believe that many births are still unregistered, it follows that the annual additions to the populations are only very partially protected. The amount of work done by the vaccinators, as shown in Form I. of the Vaccination Series, is not altogether satisfactory. For the province the average number of persons vaccinated by each vaccinator is returned as 1,202, but the range is between 2,362 in one place and only 397 in another.

6. *Sanitary Works and the Sanitary Board.*—The year's record of sanitary work done is not large. The only important operation in hand was the water-supply for the town of Merkara, and this was nearly complete. In Coorg, as in other parts of India, the great obstacle to sanitary improvements is the want of money. The Sanitary Board held two meetings during the year. It has been strengthened by the addition of a member to represent the Planters' Association, and one of the questions which engaged their attention was the improvement of the lines occupied by the coolies on planters' estates. The want of sweepers is a special difficulty which is much felt in Coorg.

8th March 1895.

No. 10.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Madras for 1893.

General Causes affecting Health.—The first 39 pages of this Report are taken up with a review of the general causes affecting the health of the people during the year, more especially the amount and distribution of the rainfall and the price of food. In former years separate diagrams were given for every district, showing such particulars in detail, but now, in accordance with a suggestion we made some time ago, both have been included in one diagram, to which has also been added a résumé of the birth and death registration in each month, and the whole compared with the results of former years. Each of these district diagrams bears the heading that it shows "the birth and death-rate per "mille, with rainfall, and prices of food (rice) during the year 1893, compared with 1891 and 1892, "and the average of the 10 years ending 1890." A diagram which embodies so much information is necessarily somewhat complicated. The form adopted seems well fitted for the purpose, and it is doubtless a great advantage to bring the facts regarding births and deaths in immediate apposition with those regarding meteorology and food supply. We would suggest that each of the diagrams should have footnotes to explain clearly the meaning of the various groups of figures and other symbols employed. The tabular statement at the end of this opening chapter gives the general results in abstract. From this we learn that the rainfall of 1893 was greater than that of 1892 in all the districts except six, but there seems to be no immediate connection between rainfall and deaths, for in every district except four the mortality was under that of the preceding year, and in two of these the figures for the ten years were almost the same. In several where the rainfall was greater than it had been for years, there was a very marked fall in the death-rate, but in others again, such as Kistna and Kurnool, where the rainfall was less than in 1892, there was an equally decided diminution in the deaths. In all but three districts the prices of food were more or less under the rates for 1892. The differences in the rainfall of different years are very clearly shown in the statistics of individual years, the actuals for which are given in one of the columns of this abstract. During the six years quoted the annual total varied,—

In South Arcot, between 49 and 29 inches.
In Trichinopoly, between 43 and 23 inches.
In Tanjore, between 53 and 28 inches.
In Tinnevelly, between 40 and 15 inches.
In Ganjam, between 59 and 27 inches.

These examples are sufficient to show how little is to be learned from averages which mix together a series of extremes.

2. *System of Registration.*—Some interesting particulars are given of the system under which the births and deaths are registered, and the difficulties which are met with in the endeavours to attain greater accuracy of the records are well described. The constant supervision and inspections made

* According to Vaccination Statement, No. 1. In the body of the Report it appears as 1,122.

by the officers of the Sanitary Department and various civil officers during their tours must have an excellent effect and do much to effect improvement. The Civil Surgeon as Sanitary Officer of his district has the returns forwarded to him by the Collector, and has the opportunity of calling attention to any entries that evidence carelessness, or seem to call for explanation. In the municipalities penalties are inflicted for omission to report births and deaths, but the statement of these, which is furnished at page 43, seems to show that the byelaws in this matter are very loosely acted on. Of the 55 municipalities named 24 return blanks, and among the others there is marked divergence—between one case in one municipality and 206 in another. Nor does it seem to be a matter which depends on population, for the town of Madura, with a population of 87,121, is one of those in which the byelaw appears to have been a dead letter. In several of our other memoranda on the Reports for 1893, we have drawn attention to the remarks of the Chief Commissioner of the Central Provinces on this question of penalties for omission to report births and deaths, and we refer to them again here, because some general system of the kind he proposes seems to be much needed in all the provinces. The Deputy Inspectors of Vaccination, of whom there are 53 in the Presidency, have been found useful in inspecting village registers, and some extracts from their diaries are quoted in illustration of their work. The complaints on all hands refer only to omissions. No mention is made of any fictitious entries having been found, which is so far satisfactory.

3. *Births.*—But in spite of all the endeavours that are being made, the registration lags considerably behind that of many of the other provinces. From the statistics contained in Form I., which are based on the census of 1891, the average registered births in the Madras Presidency equalled only 27 per 1,000 in 1893, which, though an advance on the ratio for 1892, must be considerably under the truth. Divided according to town and country circles, the figures show 32·4 for the one class, and 26·5 for the other. If we take the district rates as a whole, the range is between 18 and 40 on the estimated or deduced population, and in municipal towns, calculated on the same basis, it is between 16 and 46. The diagram opposite page 52 shows in a graphic way how 193 of the registration circles stand in respect of the birth-rate recorded during 1893. It would be more complete if all the 270 circles could be included in this diagram, but probably want of space prevents this being conveniently done. Assuming that the birth-rate must equal 35 per 1,000 at the very lowest estimate, there were only 15 circles out of the 193 shown on the diagram, which come up to this moderate standard, and many of them fall far below it. In 24 of them the rate was under 20 per 1,000. From an analysis of the results in the municipal towns, rural towns, and rural villages, grouped together district by district, the Sanitary Commissioner shows that the neglect is greatest in the rural towns, but taken as a whole for the province, there is no marked contrast between them and the rural villages, and both fall much short of the rate recorded in the municipal towns, though, as already mentioned, there is great disparity among these when taken individually. The details of Form I. which relate to every one of the 270 circles of the province, bear evidence that in all the districts many of the births must be left out, though the extent of the neglect indicated varies much. We may cite a few examples by way of illustration.

District.	Average Birth-rate for District.	Maximum and Minimum Birth-rate in the Circles.		Maximum and Minimum Percentage of Male to Female Births.	
		Maximum.	Minimum.	Maximum.	Minimum.
Anantapur	25	27	15	130	97
Chingleput	35	38	2	107	64
Cuddapah	23	27	16	126	93
Godavari	23	38	13	169	88
Kurnool	26	32	9	110	77
Madura	29	41	10	140	81
Nellore	22	34	10	133	95
North Arcot	28	39	8	144	87

We have added the figures relating to the proportion of the sexes in the births recorded, because they also supply a test of probable accuracy and aid in pointing out the particular circles where the local authorities seem to need stirring up. In some of our other memoranda on the 1893 Reports, we have suggested that more interest would be created in registration, and a certain amount of education in the matter would be given, if each district were supplied with vernacular copies of so much of Forms I. and II. as related to it, sufficient number being provided to allow of distribution to all the circles it contains. We believe that some good might be effected in this way.

4. *Deaths.*—It is not easy to apply to the death statistics such tests as we have applied to the births. We can merely note the facts as recorded, and point to any that deserve attention. The provincial average mortality of 19·3 for the year 1893 alone indicates defective registration, and all the more so because we find that in the municipal towns where the matter is better attended to the death-rate equalled 29·0, while in the rural tracts it was only 18·5. The mean infant mortality, 156 per 1,000, is much under that registered in some other provinces, and is made up of remarkable extremes ranging between 93 and 296. The very low mortality recorded in nearly all the districts is suspicious of many omissions. Leaving out Madras, where it reached the maximum of 41 per

1,000, there are only 8 in which it exceeded 20. In the other 11 it ranged between 19 and 12 per 1,000. We fear that any deduction drawn from such figures would be far more favourable to life in the Madras Presidency than the actual facts. If we take the deaths according to sex, there is no very incredible difference in the comparative ratio for males (20·0), and that for females (18·6), but when we examine the details the disproportion in very many circles points to the omission of many female deaths. Before considering one or two of the chief diseases during 1893, we may note generally how the deaths recorded under each of the great heads compare with those of the year previous.

Population, 33,693,179.

Births registered, 909,153 = 27·0 per 1,000.

Causes of Death.	Number of Deaths Registered.		Ratio of Deaths per 1,000 of Population.	
	1893.	1892.	1893.	1892.
Cholera	32,209	79,033	1·0	2·3
Small-pox	27,289	43,757	·8	1·3
Fevers	258,415	280,627	7·7	8·3
Dysentery and diarrhœa	23,814	32,293	·7	1·0
Injuries—suicide	1,958	2,120	—	—
„ wounds and accidents	6,711	7,094	—	—
„ snake-bite, or killed by wild animals	2,040	2,098	—	—
Total injuries	10,709	11,312	·3	·3
All other causes	297,346	303,733	8·8	9·0
Total	649,782	750,755	19·3	22·3

5. *History of the Chief Diseases: Cholera.*—The more important facts relating to the cholera of 1893 are that the disease was much less prevalent than it had been in the year previous, and that in only four districts was it at all severe, these four being Coimbatore with a cholera death-rate of 1·1 per 1,000, Kistna with 1·6, Trichinopoly with 4·7, and Tanjore with 4·8. The synchronous rise and fall of the disease which is especially marked in these two last districts is deserving of notice. The contrast between 1893 and 1892 in respect of cholera obtains not only for the province as a whole, but also for every district except three. With these exceptions (Coimbatore, Tanjore, and Trichinopoly) the death-rate due to cholera was less, and in many of the districts much less than it had been in 1892. To produce results of such magnitude some great general cause or causes must have been at work. It is idle to ascribe them to accident or a series of accidents. The Sanitary Commissioner has discussed the "mode of origin and spread" at some length, and has been at much pains to collect the facts from medical officers, but their account of what happened is in many instances wanting in precision and tinged too perceptibly with theoretical views. Nothing is to be gained by bringing these into the question. Practically, all that can be done is to investigate the condition of any place where cholera has been prevalent, to discover what sanitary defects it labours under, and to take measures as soon as possible for their removal. The great causes which govern epidemics are still beyond our ken, but the local conditions which favour them can be dealt with with decided effect. If we look at the latter columns of Form II. we find ample evidence of a state of things favourable to cholera—sewage soaking into the ground, cesspools abounding, and impure water liable to be contaminated in every conceivable way. These are some of the main evils which exist more or less all over the country, and it is to the remedying of these that the efforts of the Sanitary Department should be directed. We are glad to note that so much is being done in the Madras Presidency towards this great and difficult work.

6. *Small-pox and Vaccination.*—The general death-rate from small-pox throughout the Presidency was largely due to unusual prevalence of the disease in the district of Malabar. Here 12,068 fatal cases were reported, or in the ratio of 4·6 per 1,000. In 1892 also Malabar headed the list, but in that year it suffered slightly less than in 1893. These results are attributed to the repugnance of the Moplahs to vaccination, and this conclusion is so far borne out by the statistics of a series of years which place Malabar among those districts where small-pox prevalence has been associated with neglect of vaccination. At the same time it is to be noted that in respect of the protection afforded by vaccination there are three other districts in which this protection was even in a lower proportion to the population than in Malabar, though in them small-pox was less prevalent. The statistics are shown in the diagram which faces page 20 of the separate Report on Vaccination for 1893–94. This diagram it appears includes ten years; this should have been clearly stated on the diagram itself. The general facts which it discloses bear evidence to the benefits which vaccination has conferred on the population, and the same may also be said of the separate diagram which follows it relating to municipalities, though there are a few striking exceptions in it to the general law, that a low mortality from small-pox is associated with a high rate for vaccination. In adducing reasons to explain any unusual mortality from small-pox in a district, it is to be borne in mind that almost every year one or more districts are distinguished by an excessive death-rate from small-pox, and that they are by no means always the same districts. In looking over the statistics of the last few years we find instances of high mortality. In 1892 and 1893 it was in Malabar, but the disease was almost equally fatal in Ganjam and Kurnool in 1889, and in South Arcot in 1890. In Kistna in 1891 the death-rate from small-pox was higher than it was in Malabar in 1893. For the province

this death-rate in 1893 averaged only 0·8 per 1,000, but there are not a few registration circles in which it equalled or exceeded 2 per 1,000. Even in the district of Malabar, where it was so prevalent, the contrast between the mortality in the individual circles is striking, varying as it did among them between ·4 and 10·6. The separate Vaccination Report has been fully reviewed by the Local Government. The most important points are the large proportion of the infant population which is still left unprotected, the necessity for constant and strict inspection, and the doubt which is thrown over the figures by the very high ratio of success claimed, especially in re-vaccinations. On this last head the remarks of the Deputy Sanitary Commissioner in connexion with his inspection of the Cuddapah district are not reassuring. He says, "I regard it as proved, as has long been "suspected in consideration of results there secured taken in conjunction with various other matters "that have come to my notice, that the vaccination statistics of this Presidency are only approxi- "mately correct, and that the large percentage of success claimed is more or less apocryphal"— additional evidence of the truth of what we have so frequently urged that the only real test of the efficiency of the Vaccination Department is the influence it has had in diminishing small-pox. We observe that the re-organization, of this branch of the Sanitary Department was under consideration, and also that steps were being taken to extend compulsory vaccination to the major rural unions.

7. *Sanitary improvements.*—Regarding fevers and the other great heads under which deaths are registered we have no remarks to offer, and turn now to consider what is the most important part of the Report, and that is the record of the sanitary improvements which have been effected during the year. These are discussed partly by the Sanitary Commissioner in Section IX. of his Report, and partly by the Sanitary Engineer in his own separate Report. Section IX. deals in the main with minor works, and with the sanitary condition of municipalities and rural areas, but notes are also given of inspections of some of the major works which had been executed, and the remarks show how important it is that all such schemes should be fully considered and criticised both by the sanitary and engineering authorities before they are actually put in hand. The year was one of further progress both in general sanitary administration and also in the execution of works of improvement. The Sanitary Engineer's Report shows continued progress in the construction of water-supply and drainage works, the total estimated cost of which amounts to Rs. 16,40,000; of these two had been completed and on a third one little remained to be done. We trust that the Sanitary Commissioner will keep in view the importance of noting year by year the effect of all the improvements on the health of the various places concerned, comparing the death-rates from the principal diseases and the total mortality in each with the years before such improvements were effected. It will take some years' experience before sufficient statistics are collected to warrant conclusions, but very valuable evidence ought in time to be available which should prove a strong argument, if any further argument is needed, for urging similar reforms in other places. Further progress was made during the year in surveying municipalities with a view to the preparation of schemes of water-supply or drainage, but as the number of such schemes which are already actually in hand, or ready to be taken up, is sufficient to occupy the engineering staff for some years to come, no more surveys are to be made for the present.

8. *Sanitary Board.*—The Sanitary Commissioner and Sanitary Engineer continued to constitute the Sanitary Board. Incidental mention is made of various matters which had been referred to them, but there is no special account of their work during the year. From the enclosures of a despatch from the Government of India which has recently been forwarded for our information (No. 3, Sanitary, dated 6th February 1895), we learn that from the beginning of the current year certain changes take place in the constitution and manner of working of the Board. The two officers above named will continue to be members, and will also be joint secretaries to the Board, of which the Chief Engineer will be President. New rules have been prescribed for the conduct of business, under which it is hoped that all questions will be fully considered both in their sanitary and engineering aspects before the commencement of any work is sanctioned. We believe from our own experience that the end in view can be attained more thoroughly by actual meetings of the Board than in any other way. The subject in hand can then be fully considered and discussed from every point of view, and differences of opinion can be much more readily removed than by correspondence. We are aware that in India, especially during the touring season, it is often almost impossible to arrange for such meetings with due regard to the other duties which the members have to attend to, but we still believe that meetings should be held whenever they can be conveniently arranged. Unless the opinion is the conjoint opinion of the Board it must lose much of the weight which would otherwise attach to it.

14th May 1895.

No. 11.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Bombay for 1893.

Suggestions for further information on certain points.—It would add considerably to the interest of the Bombay Sanitary Reports if they were taken up to a less extent with a merely statistical examination of the registration of births and deaths. Such an examination is certainly desirable, and

it is carried out in this Report for 1893 as usual with great care and a full consideration of the details, but even in respect of these statistics some information on the system adopted in carrying out the registration, even if it involved repetition year after year, would be useful, and need occupy very little space. Moreover, it is well to know how the system worked during the year under report, where it seems to fail, and what changes, if any, appear to be required for making it more efficient. How far have the registers been inspected by the officers of the sanitary department, by the Civil Surgeons, and by other officials in the course of their tours, and what was the state of things found at these inspections? On these important points the Sanitary Commissioner has not entered, nor has he discussed some other matters which demand notice in an annual report—such, for example, as the general causes affecting the health of the people, the meteorology, and the prices of food, which, as we have frequently pointed out, have a most important bearing on the results of the year. The progress of sanitary improvement might also be dealt with more fully. Section IX., which should be devoted to a record of those improvements which have been effected during the year, merely refers without comment to a tabular statement in Appendix VI., which contains a "statement showing the "estimated income and allotment for sanitary purposes in each municipality during the year." We observe that this statement has been adopted under the orders of the Government, and it no doubt contains much information in a concise way. It has the further advantage that the expenditure of the different municipalities under each head can be conveniently compared, but it is not possible to learn from it what was actually done, and in regard more especially to the expenditure of considerable sums it is essential that this should be explained. For all practical purposes Section IX. is indeed the most important of the whole report, and it is therefore very desirable to know how the money was being spent, and whether the Sanitary Commissioner is satisfied that it was being laid out to the best advantage.

2. *Relation of the Vaccination Staff to Registration of Births and Deaths.*—In regard to registration of births and deaths, the first point which calls for notice is the unfavourable account of the employment of the vaccination staff in the endeavour to render the returns more accurate. It is said that some improvement has been effected by this means, but that it has been effected at the expense of vaccination. The Sanitary Commissioner says: "The cause of vaccination has thereby suffered, "inasmuch as vaccinators incur the displeasure of the village officials whenever they report omissions "in the birth registers, for which the registrars may be fined or otherwise punished, the result being "that the vaccinators lose the influence and support of the village officers in collecting children for "the purpose of being vaccinated." We may observe that this is the only unfavourable report on the subject. The general verdict in all the other provinces is to the effect that valuable aid has been rendered by the vaccinators in improving the registration, and no mention is made of any ill result having been thereby caused to vaccination. Further particulars of the experience gained in the Bombay Presidency would have been of interest, and would probably have helped to a full understanding of the question. It may be assumed that the complaints in question have been made by the vaccinators, and have probably been put forward in extenuation of any shortcomings in their own work. Before accepting their statements, therefore, it is very necessary to look well into the facts of at least some of the places where such complaints have been made, and to inquire both from the village officials and others whether there is any real ground for them. But apart from this it would seem from the Sanitary Commissioner's remarks quoted above that the vaccinators in this matter are being put in a position which we did not intend. When we suggested that the vaccinators might render valuable assistance in the better registration of births and deaths we never contemplated their being converted in any way into a sanitary police, whose duty it would be to report neglect and have the offender fined or otherwise punished. This, we believe, would be a mistake in every way, because it would tend to render vaccination unpopular, and also because it would be a direct temptation to the vaccinators to neglect their own proper work and add to their small pay by extortion. All we had in view was that the vaccinators would prove of the greatest use in the matter by gaining information, on the one hand, as to the state of the registers, and by pointing out to the people, on the other, the object of the registration, and so inducing them gradually to conform to a system which was not connected with taxation or any other project by which they could lose, but was intended simply and solely for their good. As regards the information to be gained, there was this further advantage, that it was of immediate use to the vaccinators themselves in carrying on their own work. They could learn how far the infants borne on their own registers had been entered on the register of births, and how far any of those whose births had been recorded had so far escaped vaccination. They could also note any case recorded of fatal small-pox, and make inquiry as to the person's previous history in respect of vaccination. Without the registers of births and deaths the vaccinator has in fact little definite information to guide him, and it is therefore a natural arrangement that he should examine them with care, and the results would fall to be reported to his superior as part of his daily work. It may, no doubt, be urged that a system of this kind which arms the vaccinator with no power and leads to no punishment can be fruitful of very little good, and that any education of the people in the advantages of registration, such as we propose, can produce but small result, but in this view of the case we do not agree. The work of improvement in this and other sanitary matters must be gradual, and probably will be very slow, but it can have no sound basis unless it is built up on the enlightenment and with the co-operation of the people themselves. We have but small faith in penalties for breaches of the byelaws concerning registration of births and deaths, more especially when they are inflicted, as they so often are, in an unsystematic way. What the experience of the Bombay Presidency has been in this matter of penalties we do not know, as the subject is not mentioned by the Sanitary Commissioner. We would suggest that future reports should show such details for all the municipalities, and, unless some regular and satisfactory system

of dealing with them has been already devised, we would suggest that the plan adopted in the Central Provinces and set forth in the orders of the Chief Commissioner on the Sanitary Report for 1893 should be put in force.

3. *Births.*—The registration of births continues to make some advance towards greater accuracy, but progress is slow. The average ratio for the province, 35·30, still falls considerably short of what seems to be the truth, but at the same time it is to be observed that this result is due in great measure to neglect in certain districts, and more especially in those of Sind. In the others, omitting Bombay City, which ranks as a district, the births recorded were in proportions varying between 29 and 47 per 1,000. In none of the Sind districts did they equal 30, and in two of them they equalled only 20 per 1,000. Even in those districts where birth registration has been most successful, there are generally one or more circles where there has evidently been neglect, and the returns from which unduly lower the general average for the district. In Khandesh, for example, with a general ratio of 47, there is one circle which returns only 21, and in Nasik these is one with 18, while the general average is 46. Numerous other instances of a like kind might be cited, which all teach the same lesson, that, in order to make the registration more correct, the individual circles must be examined separately, and those which still neglect their duty in this matter called on to make more strenuous exertions. The general proportion of male to female births (108 to 100) is manifestly higher than it ought to be, because the excess of male births is very distinctly seen to be an evidence of neglected registration. An excessive proportion of male births runs through all the Sind districts, giving very high percentages, in one of them reaching a maximum of 144 males to every 100 females. In the other districts, also, an excessive male birth-rate is to be found in many of the circles, indicating defective registration, and associated often with other signs of neglect. Indeed, so constantly are the two evidences found together, that wherever an excessive male birth-rate is recorded, we are almost certain to find that the births as a whole are much under what may be considered as the normal ratio. For example, in one circle of Nasik the male births were 134 per cent. of the female births, and the total birth-rate in that circle was only 18. In one circle of the Thana district the male births are 145 per cent. of the female births, and the total birth-rate registered in this circle is only 8 per 1,000. Like illustrations are to be found in almost every district of the province. The contrast between the town and country birth-rate (27 to 36) is also indicative of neglect in the towns. In certain towns, such as Bombay and Thana, the low rate is to be accounted for in great measure by the great preponderance of the male element in the population, but in many of the others there is no such reason to be assigned, and yet the rate is very low. We would again draw attention to the convenience which would result from having one serial number running throughout all the circles in Forms I. and II., instead of a separate serial number for the circles in each district. In the Madras report both serial numbers are given, and to this there is no objection.

4. *Deaths.*—Much the same remarks apply *mutatis mutandis* to the registration of deaths. The general results are evidently vitiated to a considerable extent by the too favourable returns from Sind, where a suspiciously low death-rate frequently associated with an excessive proportion of deaths among males leads to the inference that very many of the deaths are not registered at all, and the same is to be said of individual circles here and there throughout the other districts. The outcome of all the districts taken together is a registered mortality of 27·20 in 1893 compared with 32·50 in the year previous. Omitting Sind with its ratios ranging between 14 and 19 per 1,000, and three other districts, Thana, Ratnagiri, and Panch Mahals, where registration seems neglected, we find the ratios in the others vary between 22 and 38. Unlike the birth-rate the death-rate in the towns was higher than in the country, but the difference was not so marked, 30 compared with 26. This relation, however, is by no means constant. On examining the details contained in the statement on page 14 we find that after omitting Bombay, where no comparison of the kind can be made, there are only 13 out of the 23 districts in which the urban was greater than the rural mortality. In the other 10 districts the reverse was the case. It is also worthy of notice that the general excess mortality in the urban population is due in large measure to the imperfect registration of Sind where every one of the districts shows an excess, and almost always a very large excess of deaths in the towns as compared with the country. In some of them the town mortality is double and more than double what was recorded in the rural tracts, all which tends to show that it is in the country circles of Sind that registration is most neglected, and that any general deductions drawn from the figures in this statement as to the relative mortality in town and country are altogether misleading. As regards the great heads under which the deaths of the year were recorded, the main points to be noted are a marked reduction in fevers and cholera. In regard to Form II., which is chiefly concerned with the deaths, there is no advantage in working out the "average "population per square mile" to decimals, or in giving decimals in columns 6 and 8, for these decimals are given elsewhere. All three columns might then be made narrower, and more space given to those columns which deal with sanitary defects, and in which there is at present but little room for the important information they are designed to contain. These last colums we may observe should be filled up carefully every year for all circles, and not only for those which have been inspected during the year, as would appear to be done now.

5. *History of the Chief Diseases: Cholera.*—In the history of cholera the main facts are that the disease was much less prevalent than it had been in 1892. The deaths ascribed to it fell from 42,909 to 18,853, or from 2·8 to 1·0 per 1,000. The districts which suffered most were Surat with a mortality of 5·78, and Broach with a mortality of 3·36, though in several of the registration circles, some of which are situate in districts other than the two above-mentioned, the death-rate from cholera was still higher. Among these notable instances are Pandharpur in the district of Sholapur where

it reached the maximum of 14·08, and Dohad in the Panch Mahals which stands next with a ratio of 13·14. The five districts of Sind were practically free, as only three deaths from cholera were reported in this part of the province. Setting on one side all theories as to the possible distribution of the disease by human beings or the introduction by other means of some specific poison to which it may be attributed, and in regard to which the information given is as usual vague, the most important point to be noted is the association of the disease in many places with very marked insanitary conditions. In Surat city, for example, we are told that many of the underground tanks which are used by the better class for collecting rain water for domestic purposes "are only two or "three yards away from a cesspool. The river water is exposed to every imaginable source of "pollution. People bathe, wash clothes, and water cattle at or near the places from which they draw "drinking water,"—a very discreditable state of things, especially in such a large and important town, numbering more than 108,000 inhabitants. This is one of the places visited by the Sanitary Commissioner during the year, and his inspection notes hold out some hope of improvement; but in Appendix VI., which shows the allotment for sanitary purposes in each municipality, opposite Surat is a blank. The required returns had not been received, and there is no account of the municipal income or of how it was expended. A number of other places also failed to render this information. Again, in the town of Dohad, which has been already mentioned as one of the places with a very high cholera mortality, we are told that "most of the people drink water from a tank in which "people bathe, clean their dirty pots, and wash their dirty linen and the soiled clothing of infants." Many other illustrations of the same kind might be given.

6. *Small-pox and Vaccination.*—The deaths from small-pox though somewhat more numerous than in 1892—3,567 compared with 2,770—yield a ratio of only ·19 per 1,000. In districts the highest was ·78 in Thana. In one of the rural circles of this district the ratio attained a maximum of 10·08, but in no other circle throughout the province was there any approach to this, and in very rare instances did it equal 1 per 1,000. This is satisfactory, and bears *primâ facie* evidence to the good work of the vaccination staff. The account of this work during 1893–94 is given in a separate report. It shows that there was a slight decrease in the number of operations as compared with 1892–93, and this decrease also extends to the infant population, but even with this reduction 76·52 per cent. of the births of the year were reported to be protected by successful vaccination, and this is a very favourable outturn for an Indian province. The success claimed in re-vaccinations (75·60) is suspiciously high. The diagrams illustrative of the extent of vaccination and prevalence of small-pox in the different districts during a series of years, although they present anomalies on which the Sanitary Commissioner might have thrown some light, indicate an amount of success in the diminution of small-pox which is encouraging to still further exertions.

7. *Sanitary Board.*—The Sanitary Board consisted as before of the Sanitary Commissioner and the Sanitary Engineer. These officers inspected together a number of places and inquired into their sanitary condition. They made many suggestions for improving this condition, more especially as regards drainage and water-supply, and we trust that there may soon be much to report in the way of actual work done as the result of their deliberations. There can be little doubt that the method adopted of touring together and discussing on the spot what can be done and ought to be done in order to deal successfully with existing evils is the best which can be adopted. The various questions can be gone into thoroughly, and differences of opinion as to how many difficult matters ought to be settled are much more likely to be satisfactorily arranged than could be done by correspondence.

8. *Health of the Port.*—In the Report of the Health Officer of the Port of Bombay, which forms Appendix II., there are two important matters which deserve attention. First, there is the insanitary condition of the harbour and foreshore which is still much defiled. In their orders on the Report the Government of Bombay has called on the local authorities to remedy this discreditable state of things, but the complaint is one of long standing, and so far little improvement has been effected. A decided reform in this matter is very urgently called for. The other point is the difficulty of obtaining information regarding the health of pilgrim vessels between the time they leave Bombay and the time of their return. The Health Officer of the Port very rightly lays much stress on the necessity for having this information, and refers particularly to the case of the "Knight of St. John," in illustration of his remarks. If India is to be in a position to show that the interference which it has been sought to exercise with her pilgrim traffic is to a large extent unreasonable, and that the dangers attendant on this traffic in respect of the diffusion of cholera westward have, to say the least, been much exaggerated, she must see that every year the most accurate and complete information regarding all pilgrim ships is placed on record. We referred more particularly to the kind of information desired in our memorandum on the Bombay Sanitary Report for 1892.

14th May 1895.

No. 12.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of the Hyderabad Assigned Districts for 1893.

Comparison of Registration and Census Returns.—The registration of births and deaths in this province has been in force since 1868. In the earlier years, as was to be expected, the results were very imperfect, but improvement was gradually effected, and there is good reason to believe that it has now attained a fair degree of accuracy, a degree of accuracy, in fact, which was hardly to be looked for, considering the very rude machinery by which the work is carried out. In other years all that has been attempted in the way of analysing the returns and judging of their probable approach to the truth has been to compare them with those of other countries where the system has been much longer in force, and where it has been conducted under conditions much more favourable than those which are to be found in any part of India. Comparison was also made between the returns of different districts taken separately, and of recent years this comparison has been made still more searching by examining the returns of the individual registering circles, of which there are 103 in Berar. In this Report, for the first time, an attempt has been made to subject the figures to another test. On the one hand, the Census gives the population as it was numbered in 1881, and again in 1891, while, on the other hand, the registration of births and deaths during this ten-year period shows what the population of 1891 ought to have come out if this registration had been correct. The comparison of the totals is necessarily vitiated to a large extent by the introduction of "immigrants" and "emigrants," who must be taken into account. The number of these entered in the statement cannot be considered as more than an approximation to the facts, but the general verdict of the Census Report is that "the vital statistics are fairly accurate in general results," and this verdict is borne out by certain details as worked out from the registration records and compared with the census figures. This is satisfactory and speaks well for the continued efforts of the Sanitary Department in Berar during a long series of years. We would suggest that when another opportunity of comparing the registration of births and deaths with the census arises, the province should be taken not only as a whole but also by districts, and that some of the larger towns should be considered separately.

2. *Measures for improving Registration.*—Meanwhile the importance of taking every means to improve the registration has not been lost sight of, and among these prominence is given to the constant inspection of the registers in towns and villages by officials of all classes in the course of their tours. The table in paragraph 8, which contains the result of these inspections in 1893, raises the question why in some districts so much more was done in this matter than in others, but doubtless as the system which was new becomes better established it will be more fully acted on. More information on the nature of the defects noted at such inspections would be both useful and interesting. Particulars which cannot be embodied in a tabular statement, but which might be recorded in the body of the report, would aid much in showing the difficulties which are encountered in endeavouring to secure more accurate registers, and would point also to the best methods of overcoming them. The district of Wun has long been a main source of error in the provincial records, but the Sanitary Commissioner is sanguine that the renewed instructions which have now been issued by the district officer will lead to decided improvement.

3. *Births.*—A comparison of the later with the earlier years of registration affords very gratifying evidence of advance in accuracy. In paragraph 10 the births are tabulated year by year from 1868 to 1893, and in all the districts it is evident that there has been steady progress. The provincial birth-rate for 1893 was 39·3 compared with 39·9 in 1892, and 42·8 in 1891. The year 1891 was very unhealthy; to this was attributed the falling off in the births for 1892, and the Sanitary Commissioner is inclined to believe that the same unfavourable influence still effected the births of 1893, more especially as food continued dear, and the people were therefore the less able to feed themselves well enough to shake off the effects of illness. A comparison of the births by months in a series of years would help to settle this question. In all the districts the birth-rate of 1893 fell more or less short of that of 1891, and in several of them the deficiency was considerable. It is only by a careful and complete examination of all the details regarding the births in the 103 registering circles that a proper estimate can be formed of the condition of the registration throughout the province. For such a purpose the provincial average, or even the district averages, are altogether insufficient. Such an analysis of Table I. has been made by the Sanitary Commissioner, and as a whole the outcome is satisfactory; omitting the confessedly imperfect returns from the Wun circles the range in the birth-rates is not excessive, and the nearer approximation of the town and village ratios as a whole is indicative of progress. The proportion of males born to every 100 females born presents more marked contrasts, such for example as between 78 at Budnera and 143 at Mehkar. Although the birth-rate for the province, as already stated, was under what may be regarded as the normal ratio, there were only seven circles out of the 103 in which it was less than the death-rate for the year, and the net result over the whole province was an increase of 6·7 per 1,000 to the population, the deaths having numbered 92,951, and the births 111,924.

4. *Deaths.*—The year is described as "a normally healthy year for Berar." There was an increase of mortality over that of 1892, but a considerable decrease when compared with 1891. and this remark applies not only to the province as a whole but also to every district except Buldana, in which the ratios for 1892 and 1893 are the same, and show a large reduction on the ratio of 1891. The history of the year under review thus affords renewed evidence of the widespread character of the influences which affect the health of the people. Form No. II. deals with the deaths in the various registering circles as well as in the districts and province as a whole, and attention is drawn

in the Report to the more important points which this form illustrates. The need for considering the details along with the general results is shown in regard to many of these points, and in none more forcibly than as respects the mortality in towns as contrasted with that in rural circles. For Berar, as a whole, there is only a fractional difference between the two ratios, the rate in towns having been 32·4 and that in rural circles 32·7; but when we examine the results in districts we find that the provincial average is really the product of two sets of extremes. In three out of the six the rural mortality is much less than that of the towns, whereas in the other three the case is quite the reverse. Under such circumstances any conclusions based on the provincial average would certainly be erroneous. It must always be difficult, if not impossible, to gauge the influence of any single factor in determining the death-rate, whether it be age or sex, or dwelling in the country as contrasted with dwelling in the town. The causes at work in the production of disease are many and complicated, and are so bound up with local conditions in each case that they cannot be separated or tabulated with any degree of precision. So far as sanitary work is concerned these local conditions are the most important of all, and we are glad to observe that this Form No. II., which deals with deaths, has now been extended so as to show in conjunction with the mortality in each circle, and the proportion of that mortality recorded under each of the principal diseases, which are the chief sanitary defects in each locality.

5. *General Causes affecting Health.*—Before considering the history of one or two of the diseases which chiefly contributed to the mortality, we may note how the deaths under each main head compare with the number in the year previous. On the whole there were 10,827 deaths in excess of the total of 1892. We need not reproduce the figures in full, as they are already placed side by side in paragraph 22 of the Report, but it is worthy of notice that with the exceptions of "cholera" and "injuries," there is a very considerable increase under every other head. Another marked difference between the two years is the low death-rate of the early months of 1893 and the high death-rate of the later months. We observe that this was coincident with an epidemic of influenza which affected more especially the southern part of the province, and, as we learn from the Vaccination Report, was very severe in the first quarter of 1894. More information in regard to this epidemic would have been of interest. We are well aware of the difficulties of obtaining accurate data on such a subject as respects the general population, but many valuable facts might always be gathered from Civil Surgeons, who have excellent opportunities for observation in the dispensaries and jails under their charge. Two causes are noted as having acted unfavourably on the general health. First there was the dearness of provisions, which made life harder than usual for the people, and secondly there was the abnormally heavy rainfall in November.

6. *History of Chief Diseases: Cholera.*—The history of cholera during the year does not present any novel or otherwise remarkable features. During the first six months the province was altogether free from the disease; on the same day of July it appeared in two of the districts. two days afterwards it showed itself in a third district, and the other three were affected before the end of August, but in none of them was the mortality caused by cholera heavy. The disease was widely spread, for of the 103 registering circles 52 suffered, but the number of villages attacked was only 130 out of the total of 5,802. Even in the Akola district where the people were most affected the number of villages returning fatal cases was only 50 out of the total of 1,160. The disease was attributed by some of the Civil Surgeons to pilgrims coming from the Panderpore fair, but the evidence adduced does not corroborate this opinion, which is also questioned by the Sanitary Commissioner. It appears that discussion "relating to the importation theory of cholera has been forbidden in Sanitary Reports," and it is certainly most undesirable that such reports should be made a battlefield for mere theoretical disputations. But on this account it is all the more necessary that the facts every year should be fully recorded, and that when civil surgeons express an opinion that the disease had been imported into their districts they should clearly state the evidence on which this opinion is based. It is even of still greater importance, from a practical point of view, that they should say what steps should be taken to give effect to this opinion. Theoretical opinions on which no practical action can be based are of no value. It is disappointing to find that the towns of Amraoti and Khamgaon, the only two in the province provided with a good water supply, have not benefited as respects cholera to anything like the extent anticipated. In fact Amraoti cannot be said to have benefited at all, for the total cholera deaths during the eight years before the water was introduced numbered 433, and in the eight years after it was laid on they have numbered 430. As regards Khamgaon the results are more favourable, 169 in the second period as compared with 282 in the first period;* but although this indicates improvement the improvement is by no means so decided as was anticipated, especially by those who believe water containing cholera germs to be almost the sole agent in the diffusion of the disease. Assuming that the water is really of good quality, this illustration from Berar does not support any such doctrine, but rather teaches, as the Sanitary Commissioner has pointed out, that in addition to good water it is essential also to have efficient drainage and conservancy.

7. *Small-pox and Vaccination.*—Although the number of deaths from small-pox in 1893 showed a considerable advance on that in the year previous, 174 compared with 68, the disease was still far from prevalent. It is worthy of notice that although it proved fatal in many of the circles it nowhere assumed the proportions of a serious outbreak. The highest death-rate recorded as due to this cause in any circle was only 1 per 1,000, and the average of the province as a whole was but ·06. All this, especially when considered in the light of the experience of Berar over a long series of years, is convincing proof of the benefits which vaccination has conferred and is now conferring on the people

* The years of the second period as given at page 15 should apparently be 1886 to 1893, and not 1878 to 1885 which form the first period, but which are here given for both periods.

of the province in protecting them from small-pox. The separate Report on Vaccination for the year 1893–94 shows the care with which this important part of the Sanitary Department is watched. We entirely agree with Surgeon-Lieutenant-Colonel Little in his remark that the most important work to be done is to protect all the available infants, and that this should be carried out as far as possible before re-vaccination is attempted. This has so far been accomplished during the year under review that 78·9 per cent. of the available infants under one year of age were protected, leaving only 21·1 unprotected—a low ratio for an Indian province.

8. *Fevers and other Causes of Mortality.*—The fever mortality increased, not only in the province as a whole, but in nearly every district. Almost one-half of the total deaths of the year were recorded under this head, which contributed 16 per 1,000 out of the total 32·6. The death-rate varies considerably in different quarters, and there is a wide range between minimum and maximum even among places which are not far removed from one another, but, as has been frequently observed, no definite conclusions can be drawn from data which are necessarily imperfect, and which must remain imperfect so long as there is no educated staff capable of accurately distinguishing one disease from another to whom the registration can be entrusted. As we remarked in last year's Memorandum on the Berar Report, it is well, in considering the mortality recorded under *Fever*, to consider also the entries recorded under *Dysentery and Diarrhœa* and *Other Causes*, as they seem frequently to overlap one another. There can be no question, however, of the general fact that fevers along with other allied diseases were more than ordinarily prevalent in Berar during 1893, and that among these is to be noted an epidemic of influenza which interfered much with the work of the vaccinators. The other recorded causes of death call for little comment. It is remarkable how very little the proportion attributed to *Injuries* varies from year to year, and this fact in itself affords a certain amount of evidence that the registration under its main heads, so far as these can be understood by the people, is carefully conducted.

9. *Sanitary Defects.*—The list of defects in drainage, water-supply, and conservancy, which are tabulated for each circle in the second part of Form II., shows how formidable are the evils which have still to be dealt with, and how frequently the high death-rates recorded in the first part of this form are accounted for by the insanitary conditions described in the second. In nearly all of the circles defects in drainage are noted, and in many of them they are of a serious character. As regards water the supply is often reported to be insufficient, and in most places is subject to great risk of contamination. Defects in conservancy are of frequent occurrence. All these evils are well known to the authorities, and are plainly set forth in the form above mentioned, as well as in other parts of the Report. We are well aware of the difficulties attendant on all endeavours to remove them, but it is none the less necessary on that account to notice prominently year after year that they exist, and that little benefit can be expected to the public health till they have been remedied. We have already referred to the unsatisfactory results of the new water supply both at Amraoti and Khamgaon, and, in further illustration of this subject, we may draw attention to the fact that, in the second year after this new supply was brought into Amraoti, the deaths from cholera were much more numerous than in any one of the eight years before its introduction, of which the statistics are given. No doubt the incidence of cholera depends to a large extent on causes the exact nature of which we have still to learn, and it may be, and probably was, the case that in this particular year these causes were localized in unusual force at Amraoti. We are not among those who think that once a good water has been provided for a community no further action is needed to protect it from cholera, but it is most discouraging to find that a new water supply has been attended with little or no diminution of the disease. The question is one which calls for very careful investigation, both in itself, because the work has been done at considerable cost, and also, which is far more important, because of its bearing on further projects of a like kind in other places. Unless it can be shown that waterworks have benefited the health of Indian towns to a marked degree, municipal bodies cannot well be urged to undertake them. The experience of these two Berar municipalities, however, is opposed to that of other Indian towns, and notably of both Calcutta and Bombay. We would, therefore, suggest that an exhaustive inquiry should be made both as to the original character of the water in Amraoti and Khamgaon, the possibility of its pollution in some part of its course or at its delivery, and also into the statistics of deaths over a series of years both before and after the new supply was brought in, statistics not only of cholera but of all diseases. In making this suggestion we still adhere to what we have already said in paragraph 6 regarding the importance of good drainage and conservancy, but it is very desirable that the fullest information should be obtained on the water part of the question.

10. *Sanitary Improvements.*—The only large work in progress was the Akola water supply. This had been nearly completed. The water was to be led in from a tank at Kapsi, 10 miles distant. The rest may be summed up in the words of the Commissioner, Colonel Mackenzie, who writes, "As to our sanitary efforts our means are limited, but, with the advice and assistance of the Sanitary "Commissioner, they are directed to coping with our difficulties and necessities under the three heads, "water supply, drainage, and conservancy, in the order of their importance as they arise."

11. *Sanitary Boards.*—It will suffice to note that the work of these Boards continued on the same lines as has been noted in other years. Progress is recorded in the sanitary survey of towns and villages. Of the towns only eight of a total of 39 remained to be dealt with, but of the villages a very large proportion had still to be taken in hand.

8th March 1895.

No. 13.

Memorandum by the Army Sanitary Commission on the Administration Report of the Commissioners of the Town of Calcutta for 1893–94.

1. *General Conditions affecting Health.*—This Report affords continued evidence of activity in dealing with sanitary defects, and also of the benefits to the public health which may fairly be claimed as the result of the improvements already effected. Of the general conditions which characterized the year some mention is made in paragraphs 2 and 3 of the Health Officer's report, and from these we learn that the rainfall was unusually heavy. This seems to have been the most marked feature in the meteorology, but more particulars as regards this and also as regards temperature and humidity as compared with former individual years would have been of interest. We find also that the prices of all the chief articles of food—rice, meat, fruit, fish, and vegetables—were higher than the average of the preceding nine years.

2. *Births.*—The birth-rate for the town and suburbs combined (19·7) was the highest yet recorded, which is indicative of better registration, especially in the suburbs. In them the rate equalled 22·6, while in the town itself it was only 18·4, a result, no doubt, due in great measure to the smaller proportion of women in the population, for while in the suburbs there were 153 males to every 100 females, in the town the proportion was 211 males to every 100 females. Judging from the experience of other parts of India the excess of male to female births recorded in both town and suburbs, and especially in the town, leads to the conclusion that the registration in both is still imperfect, for in the town the percentage of male to female births was 113, and in the suburbs 108; the proportion in the combined area being 111. An examination of the details tends to confirm this opinion, for the discrepancies in the different registering sections seem hardly capable of explanation in any other way. Omitting those where the total number of births was small, we find in the town that the percentage of male births ranges between 95 and 134, the larger rate being associated with a low birth-rate, as is generally the case where an abnormal excess of males is observed as one of the most constant evidences of neglected registration. In the suburbs there are even more striking deviations from what we may regard as the normal proportion between the sexes of the children born. It is only by examining the different wards individually that the chief defaulters in this matter of registration can be found out. We are glad, therefore, to have Table 5, which presents both births and deaths by localities in a concise form, and hope that it may keep its place as one of the standard tables to appear in all such annual reports.

3. *Deaths.*—In the combined area the deaths were in almost the same proportion as in 1892—29·5 compared with 29·6, but in the town taken by itself the mortality was reduced from 27·1 to 25·9. In the suburbs, on the other hand, there was an increase from 34·8 to 37·1. The most noteworthy facts in connection with the mortality are that cholera and small-pox were both in remarkable abeyance, but that fevers were more prevalent than they had been for ten years. According to locality the death-rate shows great extremes. In the town proper it ranged between 12 and 33 per 1,000, and in the suburbs between 19 and 42. The very high mortality among infants is deserving of notice. In the suburbs this equalled 374 and in the town proper 442 per 1,000.

4. *Fevers.*—Among the principal diseases to which the deaths of 1893 were ascribed the first dealt with is *fevers*. Of the 20,113 deaths recorded during the year 8,091 were due to this cause, or 11·9 per 1,000. For the town proper the ratio was 10·1, and for the suburbs 15·5. The Health Officer points out that fevers of late years have been steadily increasing, and urges as a remedy for the town that the defects in the drainage which were noted by Mr. Baldwin Latham should be removed, and for the suburbs that a proper system of drainage should be undertaken there. This last work has been under consideration for some years, during which a scheme has been in preparation for draining eight square miles of the added area. There can be no doubt that such a work is much required. The soil is at present to a great extent water-logged. The existing drains do not act, and in many places are described as merely "elongated cesspools." A proper surface drainage would be an immense boon to the area in question and could not fail to be attended with marked improvement in the health of the inhabitants, but the work is one which involves considerable expenditure, and it is essential that it should be executed on the most approved principles. The Commissioners have, therefore, wisely resolved before deciding on a scheme to have all the data carefully examined and the proposals reported on by the best authorities.

5. *Cholera.*—The cholera mortality in 1893 was the smallest on record. During the five years for which the statistics of the combined area are given, the next lowest number of deaths from this cause was 1879 in 1890; in 1893 the number was only 869. The reduction was marked in both town and suburbs. In the former the previous minimum during the five years had been 963, in 1893 the total was only 596. In the latter the total in 1893 was only 273, against the previous minimum of 762. The Health Officer observes that the districts around Calcutta enjoyed a similar comparative freedom from cholera during the year under report, and he cites the statistics of six of these districts, which show not only the general fact of comparative immunity, but also that the monthly rise and fall of the disease, even within its more than ordinarily confined limits, followed much the same course throughout them all as they did in Calcutta. However much the force of the disease was restrained by better local conditions in the town, it is self-evident that some great and widespread general cause was at work. The great fact of cholera abeyance in 1893, as compared with 1892, comes out strikingly if

the total deaths in the two years are placed side by side. In the districts which the Health Officer selects for comparison the results stand thus:—

—	1892.	1893.
24-Pergunnahs	8,789	1,561
Nuddea	10,591	4,331
Jessore	11,286	3,624
Moorshedabad	4,617	4,390
Howrah	2,996	1,421
Hooghly	1,981	936
Calcutta	2,019	869

In all of them the figures are in favour of 1893, and in all except Moorshedabad the contrast is very marked. If we look at the distribution of the disease in Calcutta during 1893 we find that it was very general, but n where severe. The cholera mortality in the town and suburbs was exactly the same, 1·2 per 1,000, and the highest ratio in any one ward was 2·2.

6. *Small-pox and Vaccination.*—The low mortality from small-pox was almost as remarkable as the low mortality from cholera. Only 31 fatal cases were reported, of which 13 were in the town and 18 in the suburbs, or the equivalent of only ·04 per 1,000, the highest ratio in any one ward being ·33. As regards small-pox, however, the results in 1892 and in 1891 were still more favourable than those of 1893, the total small-pox deaths having been only 21 in the one and 18 in the other, presenting a marked contrast to the 872 deaths recorded in 1890. Small-pox, like many other diseases, has its cycles of rise and fall dependent on laws which as yet we do not understand, and generally when the disease has been for some time at a minimum a marked increase very soon follows, but the history of the disease in Calcutta during the three years in question speaks well for vaccination. We should like to know more clearly how far the infants added every year to the population are being protected by this means. Of the 13,492 children born during the year how many were successfully vaccinated? From the table on page 204 it would appear that only 4,708 vaccinations were performed on children under one year, but how many of these were successful is not stated. Even if all were successful the record is not satisfactory. It would assist greatly in the ascertainment of all such details if the standard vaccination forms used in the provincial sanitary reports were also employed in the municipal reports. These forms may be, and probably are, capable of improvement, and there is no reason why they should not be amended if good cause is shown for any change proposed, but the advantages of having a standard series to be employed by all who are dealing with the same subject are too obvious to require their being enlarged on.

7. *Leprosy.*—The only other disease on which we need remark is leprosy. The Health Officer urges that an Act should be passed providing for the compulsory segregation of "poor and vagrant lepers." On social grounds such an Act would in all probability be acceptable to the great mass of the inhabitants of Calcutta, but, from a health point of view, no facts are advanced in support of the proposal. There is nothing to show that leprosy has increased from want of such an Act, or that it would be diminished if such an Act were brought into operation. We are decidedly opposed to the compulsory segregation of lepers, either in Calcutta or any other part of India, first, because we do not believe that it would do any good, and secondly, because it could not possibly be worked without giving rise to many cases of hardship. On all practical points we agree in these matters with the conclusions of the Leprosy Commission in India, and believe that any attempt to do more than they recommend would involve an amount of interference with the people which would only be much resented, and would cause considerable expense. Opinions may differ in regard to the influence of heredity on leprosy. The Commission think this has no influence. We believe it has, but this is not a practical question. Once a leper has the symptoms of the disease sufficiently decided to warrant his segregation under such a system there is very little chance of his having any offspring to whom he or she may transmit the leprous tendency, for the procreative powers of both male and female lepers are but small. But while we are opposed to any compulsory segregation of lepers, there seems to be good reason for removing the Amhurst Asylum, if it can be done, to some other and less frequented locality where the inmates will not be a nuisance to their neighbours.

8. *Sanitary Administration and Improvements.*—Much excellent work was done by the Health Department during the year in general administration, in conservancy, and in the regulation of slaughter-houses. Further progress was also made in the filling up and cleaning of tanks, and also in the improvement of bustees, but in regard to these last it has unfortunately been found advisable to stop work because of a ruling of the High Court. Under both water-supply and sewerage important works have been executed, of which a full detail is given in the Engineer's Report.

19th June 1895.

No. 14.

Memorandum by the Army Sanitary Commission on the Administration Report of the Madras Municipality for 1893–94.

1. *Projects for Sanitary Improvement.*—When this Report issued, the town of Madras had arrived at a critical point in its sanitary history. The expert who had been sent out by the Secretary of State to examine into the condition of things, and devise the measures which appeared to him best suited to remedy it, had submitted his recommendations, and they were under the consideration of the Commissioners. No particulars are given of what these recommendations are, but Mr. Cousins was evidently much impressed with the urgent need of radical reforms, and recorded his opinion that under existing conditions the wonder was, not that the mortality was so high as it was, but that it was so low. His proposals include a general drainage and sewerage scheme, estimated to cost 23 lakhs of rupees, an improvement of the water-supply at an estimated cost of nearly 21 lakhs, and also certain measures for doing away with the nuisance now caused by the River Cooum, which are estimated at a little over 3 lakhs. We must await a full description of these various projects, which have such an intimate bearing on the health of the town, and defer any comments upon them until we learn how far they have been accepted and are about to be carried out. Under these circumstances, we need not refer to the progress made in sanitary works during the year, for this was, as might be expected, but small, and to a large extent tentative, dependent on the issue of Mr. Cousins' report. Nor need we say anything further on the sanitary defects of the town, which are set forth very fully and clearly in this Report of the President of the Municipal Commission for 1893–94, defects under many heads, which are of so grave a character as to call most urgently for removal. The President remarks that "the greatest obstacle to progress is the poverty of the town," and the large sum which the execution of Mr. Cousins' schemes involves, will, no doubt, offer a formidable difficulty, but we trust that means may be found to overcome this difficulty if it should appear, after careful examination, that the measures proposed are the best which can be devised to place the town in a proper sanitary condition.

2. *Registration of Births.*—We shall, therefore, confine ourselves to making a very few remarks on some other matters of general administration bearing on the health of the inhabitants, and, first, as regards the births of the year. The registration is carefully conducted, and the results generally satisfactory. The birth-rate, 40·2 per 1,000, is the highest yet registered, and the proportion of male to female births, 104·8 to 100, is *primâ facie* evidence of accuracy. The ratios, taken by wards, fluctuated considerably, but the apparent discrepancies to a large extent disappear if the comparison be confined to the eight divisions of the town, where the population is larger and therefore affords a safer basis for comparison.

3. *Registration of Deaths.*—There was a considerable improvement in the health of the town, as indicated by the registration of deaths. In 1891 these had equalled 52 per 1,000, and in 1892 had fallen to 46. In 1893 there was a further fall to 41, but this was still a high ratio. The President attributes the persistently heavy mortality of recent years, in great measure, to the increased price of food, which, he observes, presses much more on the towns where wages are paid in money than on the country where wages are paid in kind. In the opening chart the facts as regards prices and meteorology are portrayed side by side with the mortality, the mean of which during the 10 previous years had equalled 38·9. In looking at the distribution of the deaths by locality there are no very marked extremes. The range is between 32 and 47, but if infant mortality alone be taken there is considerable variation, the extremes being 300 in one division and 486 in another.

4. *Deaths according to Cause.*—Arranged according to causes the deaths stand thus:—

Cholera	27	=	0·05 per 1,000.
Small-pox	20	=	0·04 „
Fevers	6,628	=	14·6 „
Bowel complaints	2,708	=	5·9 „
Other causes	9,201	=	20·3 „
Total	18,584	=	41·0 „

In this summary the most noteworthy features are the remarkable abeyance of both cholera and small-pox and the large portion of the mortality ascribed to *Fevers* and *Other Causes.*

5. *Cholera.*—Excepting 1886, when the deaths from cholera numbered only 4, not one of the previous 10 years had presented so favourable a return as that of 1893, and the total of 27 deaths which it recorded under this head presents a remarkable contrast to such figures as 1,193 in 1884 and 1,916 in 1891. In January 1893 three deaths from cholera were reported, but none others followed till July, when two more occurred, and then each month till the end of the year contributed one or two. It is worthy of notice that the 27 deaths were thus spread over seven months of the year, and that they occurred in six out of the eight divisions of the town.

6. *Small-pox and Vaccination.*—The experience of Madras in respect of small-pox continued to afford striking evidence of the protective power of vaccination and of the care with which this

important work had been done over a series of years. Only 20 deaths under this head in 1893 is a very favourable record. But, as we remarked in our Memorandum on the Madras Municipal Report for 1892–93, fluctuations must be expected in the history of small-pox, even with the most careful vaccination, and when the disease has been in marked abeyance for several years is the time when, according to all experience, epidemic increase is to be feared.

7. *Fevers.* The great part of the mortality due to fevers has already been referred to. Of the gross total of 41 per 1,000 they contributed 14·6. The incidence of these diseases varied much in the different divisions of the town. In the 6th Division the death-rate ascribed to them was only 9 per 1,000; in the 2nd Division it was 20·1. The marked increase in fevers which has characterised the statistics of Madras during the last few years has been referred to in previous reports. In addition to the general insanitary conditions which favour their prevalence, there has been a great rise in the price of food, which has materially affected the condition of the people.

15th July 1895.

No. 15.

Memorandum by the Army Sanitary Commission on the Administration Report of the Municipal Commissioner of Bombay for 1893–94.

Registration of Births.—For many years now the Municipality of Bombay has been engaged in carrying out great sanitary works with a view to improve the health of the inhabitants, and the record of another year shows that they were still actively engaged on the same important object. The report of the Health Officer, however, which deals mainly with the events of the calendar year 1893, points out a number of very grave sanitary defects which still existed, and the removal of which is absolutely necessary to put the city in a good sanitary condition. But before referring to them more particularly, we may glance at the main facts of the year as respects both births and deaths, and see how the results compare with those of other years; and first, as regards births. The general average for 1893 was 18·51 per 1,000, which represents a slight decrease on 1892. Since 1888, when the birth-rate was unusually high, there has been very little variation in the yearly ratio. At page 517 a statement is given showing the results for 28 years, but without the annual population, which the statement does not show, it is not possible to say what proportion the actuals bear per 1,000 of the inhabitants. The table at page 515 gives the details by wards and sections, and here, as usual, great variations are to be found in the items, of which 18·51 represents the general average. The extremes by sections are ·04 in the Water division, and 33·87 in Tardeo. As the general low birth-rate of the city is mainly due to the small proportion of females, so the marked variations in the sections are doubtless also due in great measure to the degree in which each is affected by this abnormal condition. We should like to see this point worked out more in detail, and this could easily be done, as we have before remarked, by showing the composition of the population in each section according to sex. The percentage of males to females could then be compared with the registered birth-rate. It would be well, moreover, to show the percentage of male to female births, not only for the city as a whole, but also for each section separately, for all these details are not only of interest, but afford an excellent means of judging of the accuracy of the registration.

2. *Registration of Deaths.*—Similar remarks apply to the death statistics, for though the number of males and females in each section of the city are entered in the statement on page 484, the deaths have not been divided according to sex. There was a marked reduction in the mortality during 1893, as compared with 1892. The death-rate fell from 32·26 to 28·16, and this result was due to a diminution in all the prominent diseases. Cholera, small-pox, fevers, measles, and in fact every disease to which the deaths are attributed, with the single exception of diarrhœa, under which the numbers of the two years may be said to be identical, yield more favourable returns for 1893 than they did for 1892. It is also worthy of notice, as indicative of the wide-spread character of the forces at work in the two years, that the marked improvement in 1893 is not due to a marked reduction in the mortality of one or two sections. We have compared the death-rates of them all for the two years, and find that in nearly every one there was a marked reduction in 1893. In fact, the only decided exception to this general rule is in the case of the second Nagpada section, in which the maximum mortality (47·10) of 1893 occurred. Here, in 1892, it had not been quite so high (44·49). If we look at the distribution of this mortality of 1893 by localities, we find, as already stated, that second Nagpada heads the list with a ratio of 47·10, the next highest being Parel, with 39·07, and below these we have ratios rapidly diminishing until we arrive at the minimum of 3·29 in the Water division, where the circumstances seem to be altogether exceptional, as the population is almost entirely male, there being only 343 females to 21,799 males, and only one birth occurred during the year. Local conditions are, no doubt, most important as regards the causation of disease, but it is essential also to consider the results in connection with the composition of the population, and more especially as respects the proportion of young infants, among whom the mortality in all Indian communities is very high, and although this is only one of the many factors at work, we seem to see its influence in some of the sections during 1893, in which a high mortality and high birth-rate are associated.

3. *Deaths according to Diseases.*—We have already noted the reduction in the deaths during 1893 under all the principal diseases, and we may here place the ratios of the two years 1892 and 1893 side by side for the sake of more exact comparison.

	Deaths per 1,000.	
	1892.	1893.
Cholera	·21	·18
Small-pox	·66	·24
Fevers	10·29	7·46
Dysentery and Diarrhœa	2·22	2·07
Injuries	·48	·55
All other causes	18·40	17·66
Total	32·26	21·16

The reduction is most marked under fevers, that nondescript class which includes so many ill-defined ailments. This, in part, is due to measles mortality having declined from ·86 in 1892 to ·35 in 1893. The Health Officer has tabulated the incidence of this disease by sections and sex, and classes of the population, and he has done the same for small-pox, cholera, and phthisis. In regard to cholera he observes, and we agree in his remarks, for they embody a truth which is apt to be lost sight of, "Good as most of our water-supply now is, it is but one of other conditions "which we must have to preserve the population from epidemic influences . . . . . To believe, "as some do believe, that with a plentiful and pure supply of water there will be no more epidemics "of cholera, is, in my opinion, to believe in a delusion. Pure water is one most important condition, "but there must be pure air, and plentiful food—and abundance too—for the prevention of epidemics, "and the protection of the public health."

4. *Deaths according to Class, Sex, and Age.*—Leaving out of account a small body of negro Africans, among whom there was the extraordinary mortality of 589 per 1,000, the equivalent of 86 deaths out of a population of 146, and the Lingaits, also a comparatively small body who died in the proportion of 49·74; the class which suffered most is composed of Hindu low castes, among whom the death-rate equalled 43·25 per 1,000. The heavy mortality among them as contrasted with 37·23 among Mussulmans, 23·89 among Hindus of "other castes," 23·56 among Brahmins, 22·27 among Parsees, and 18·68 among Europeans, is the most striking, though not unusual feature in the mortality according to classes during the year, and the result is ascribed to their poverty, their consequent overcrowding, and the other insanitary conditions in which they live. In regard to age, the returns are more favourable than they were in 1892, and are indicative of that general improvement in the public health to which reference has already been made; but though reduced, the mortality among infants under one year (254·87), and among children of from one to two years of age (137·59) continued very high. As respects sex, we have a repetition of the marked excess in the death-rates among females, to which attention has been drawn in previous memoranda. In 1893 the contrast was not so marked as in the year previous, but it was still very decided, for whereas the rate for males was 23·98, for females it was 35·29. Much of the excess female mortality is, no doubt, concentrated in and connected with the child-bearing term of life. In a separate paper,* which we have had an opportunity of perusing, the Health Officer adds another reason in the fact that in Bombay so many women are employed in factories, but further evidence of the evil influence of factory life on the general female population of Bombay is required before this reason can be accepted as helping to explain the facts. Do the factory women suffer more than the women who are otherwise employed, and how are the children of both sexes affected who work in these factories? It would probably be difficult to obtain details of this kind, but the question of the high mortality among females registered in the city of Bombay, as we have before remarked, seems to need further investigation.

5. *Sanitary Defects.*—The Health Officer again speaks of several of the evils which he mentioned in the report of the year previous, and among these the most serious are the defects in drainage caused by the large influx of water into the city, and the inadequate means of sending it out. The overflowing of sewers, the backward flow of their contents, and the consequent adhering of fæcal matter to the manholes and crown of the sewers, are all spoken of facts which had come under observation. The nuisances in Colaba will, to a large extent, be remedied when the drainage on the Shone system has been fully completed; but this cannot be until the house connections have been made, and as the best means of effecting these have not yet been decided on, it is feared that there may be considerable delay in reaping the full benefit of the scheme. Another great evil is the want of proper arrangements for the disposal of the street sweepings. The flats where they used to be are filled up. In several of the districts, distinguished by high mortality in 1893, attention is drawn to local causes of disease which call for removal. Among these may be cited great house crowding in second Nagpada, the dangerous condition of certain chawls, the general want of proper drainage in Parel, and the overcrowding and otherwise insanitary condition of Mandvi. Much has been done to remove dangers to the public health in Bombay, and much is being done towards this end. Some of the great evils which still exist are very difficult to deal with, and others will require time for their removal, but it is very desirable that, so long as palpable causes of disease remain, they should be annually pointed out, so that the importance of dealing with them as early as possible may never be lost sight of.

15th July 1895.

* Received with R. & S. No. 1,295, dated 23rd August 1894.

No. 16.

Reports of the Work of the Sanitary Boards in the several Provinces of India during the years 1890–1893.

Despatch from the Government of India to the Secretary of State for India, No. I (Sanitary), dated 13th January 1892.

My Lord,

We have the honour to forward, for your Lordship's information, copies* of our orders on the Sanitary Reports of the Local Governments and Administrations for the year 1890, and on the Vaccination Reports for the year 1890-91.

2. In the second paragraph of your Despatch No. 59 (Statistics and Commerce), dated the 22nd August 1889, your Lordship asked us for a special report on the establishment and working of the new sanitary boards, and again on the 19th December 1889, you asked for an early report of the action taken and the orders issued by each Local Government under the sanitary orders issued by us on the 27th July 1888. In reply to the latter despatch we informed your Lordship in our Despatch No. 2 (Sanitary), dated the 25th February 1890, of the action taken by Local Governments and Administrations towards the establishment of Sanitary Boards, and in the final paragraph we stated, with reference to the second paragraph of your despatch of the 22nd August 1889, that, as the several Sanitary Boards must be allowed time to begin practical work, we had requested Local Governments and Administrations to cause a succinct report of the working of the Boards up to the end of the calendar year 1890 to be submitted as an Appendix to the Sanitary Reports for that year, and that we had also directed them to issue instructions for the regular submission, in a similar manner, of annual reports for subsequent years.

3. Since the date of our despatch of February 1890 the constitution of a Sanitary Board for the Bombay Presidency, consisting of the Sanitary Commissioner and a Sanitary Engineer, has been sanctioned by your Lordship (Despatch No. 74 Statistics, dated the 21st August 1890), but for the reasons explained in our Despatch No. 226, dated the 18th day of August 1891), a Sanitary Engineer had not been appointed up to that date. The creation of such an appointment outside the cadre of the Public Works Department has been sanctioned in your Despatch No. 69, Statistics, dated the 8th October last, and it is hoped that an officer will now be appointed and the Board formed at an early date. The Bombay Village Sanitation Act, I. of 1889 (Bo. C.), provides for the appointment of Local Sanitary Boards and Committees in villages or groups of villages where subordinate agency is required.

A sanitary board has also been constituted in the Punjab since we submitted our despatch of February 1890, viz., in August 1890. It consists of—

The First Financial Commissioner, President;
The Chief Secretary to Government;
The Secretary to Government in the Department of Public Works;
The Joint Secretary to Government in the Irrigation Department;
The Sanitary Commissioner, who will act as Secretary to the Board;
The Commissioner of the Division in which the Board meets;

and this Board has power to add to its number when discussing any particular scheme or work.

4. An account of the working of the several Sanitary Boards is appended to the Provincial Sanitary Reports, copies of which have already been forwarded to your Lordship direct by Local Governments and Administrations. We have offered such remarks as appeared to be called for in our letters reviewing the Provincial Reports, and it only remains for us now briefly to summarise the action taken in each province.

5. In the Madras Presidency the Sanitary Board, as approved by us, came into existence only on the 1st April 1890, and the report submitted by the Sanitary Engineer of the Board is consequently of an introductory nature. More substantial results may be expected during the current year. The Madras Local Boards Act, 1884, has furnished what ought to be an effective agency for village sanitation by constituting Unions to be administered by committees of five or Panchayets, whose principal duties (section 141) are to provide for the cleansing of the village streets, wells, and the like, and generally for all things necessary for the preservation of the public health.

The Sanitary Board for the Lower Provinces of Bengal, which was established in December 1889, did not enter fully upon its functions until August 1890, when the Sanitary Engineer joined his appointment. Since then several subjects of importance have engaged the attention of the Board, as shown in their report. The Local Government has resolved that, for the present, the Board should confine itself to municipal areas in preparing schemes for water-supply and drainage. A general responsibility in connexion with village sanitation in the areas under their supervision is imposed on the Union Committees who may be appointed for groups of villages under the Bengal Local Self-Government Act, III. of 1885 (B. C.) but no such committees have yet been appointed. In a letter No. 2, dated the 15th March 1889, we addressed the Bengal Government pointing out the importance which we attached to the formation of village Union Committees as an agency for the sanitary improvement of rural areas. The Report on the working of District Boards in Bengal for 1890–91 shows that the Lieutenant-Governor is not in favour of calling Union Committees into

---

* Not reprinted.

existence at present, but we have asked his Honour to favour us with a more detailed expression of the reasons which have led him to this conclusion.

In the North-Western Provinces and Oudh good work has been done by the Sanitary Board. The results are summed up in paragraph 5 of our letter, dated the 30th September 1891, reviewing the Sanitary Report. As for village sanitation Sir Auckland Colvin has just submitted a draft Bill which is designed gradually to secure for all the larger villages a supply of pure drinking water.

In the Punjab, as already mentioned, the Board was not constituted till August 1890, and no schemes for important sanitary improvements came under its consideration during the remaining portion of that year. A brief account of the operations of the Board is printed as Appendix B. to the report. Under the final chapter of the new Punjab Municipal Act (XX. of 1891), ample powers have been conferred on the Local Government to enable it to provide for the sanitation of villages.

In the Central Provinces the Sanitary Board, which is composed of the Deputy Surgeon-General (who is also the Sanitary Commissioner) and the Superintending Engineer, met only once during the year to consider a note of the Chief Commissioner's directing their attention to the question of a sanitary survey of municipalities. In paragraph 6 of our review on the Provincial Report we have directed attention to the necessity for more vigorous action on the part of the Board. Act XIX. of 1889 was passed by us in December 1889, in order to provide a means of enlisting the co-operation of the villagers in carrying out simple measures of sanitary improvement in the rural tracts of the Central Provinces.

The Sanitary Board for the Province of Burma has been in existence since December 1888, and has made some progress in dealing with questions affecting village sanitation, schemes for the water-supply of municipalities, sewage farming, and the sanitary improvement of the suburbs of Rangoon.

In Assam, the Sanitary Board of the Province has inaugurated a scheme of sanitation for selected villages having for its chief objects—(*a*) the improvement of the drinking water-supply; (*b*) the establishment and maintenance of a proper system of drainage; and (*c*) the prohibition of deposits of manure and rubbish in places where they would be injurious to the public health. The work of sanitation in towns and municipal areas has also been systematically taken in hand under the supervision of the board.

In the Hyderabad Assigned Districts a Sanitary Board has been created for each district with subordinate Local Boards for each village not being a municipality, and Appendix IV. to the Sanitary Report contains their proceedings showing what they were able to effect during the year.

6. As the working of the Sanitary Boards is still in the experimental stage it is unnecessary far us to add anything here to what we have said in reviewing the reports.

We have, &c.

LANSDOWNE.
P. P. HUTCHINS.
D. BARBOUR.
A. E. MILLER.
H. BRACKENBURY.
R. C. B. PEMBERTON.

DESPATCH from the GOVERNMENT of BOMBAY to the SECRETARY of State for INDIA, No. 22 (General), dated 2nd September, 1892.

MY LORD,

WITH reference to your Lordship's predecessor's Despatch, Statistics, No. 4, dated 14th April 1892, forwarding for our consideration and remarks copy of a letter from Miss Nightingale, with enclosures, relative to the better application of the proceeds of villages cesses to the purposes of sanitation, we have the honour to transmit, for your Lordship's consideration and for communication to Miss Nightingale, copies of the reports* from the Commissioner in Sind, the Divisional Commissioners, and the Surgeon-General with our Government.

2. While recognising fully that the proposals made by Miss Nightingale and the gentlemen who have signed the memorandum attached to her letter are obviously prompted by a genuine desire to promote the welfare of the rural population of this Presidency, we are not prepared to recognize the correctness of the views—

(*a*) That the first call on the village cesses should be sanitation;

(*b*) that it is possible under the existing laws to require the local authorities "to cause sufficient funds to be appropriated to satisfy the minimum requirements of village sanitation"; or

(*c*) that there exist "insanitary conditions which are undermining the health of the rural population."

3. With reference to the first of these heads, Mr. James, the Commissioner in Sind, has in paragraph 6 of his report correctly pointed out that "when the local cess was first instituted,—and "for six years it was a voluntary contribution in the Bombay Presidency,—Government distinctly "stated that the object was to provide 'roads (including village wells and public buildings, the planting "'of road-side trees and other works of public utility) and schools.'" So far as these cesses are concerned, the only modification in the policy of this Government, as regards the object of their levy,

---

* Not reprinted.

has been in Act III. of 1869 to add sanitation to the improvements of roads, water-supply and education.

4. As to the second, Mr. James has in the same paragraph of his report shown that "if all the "Local Fund schools were shut up, and the construction and repair of all public works stopped, the "amount available for each village would be only Rs. 90 per village, a sum too trivial for any "practical good" for the purposes of sanitation as expressed in the memorandum, viz., "cleansing "operations in the village." The reports of the Commissioners as well as that of the Surgeon-General show that what we consider the most essential measure of sanitation, the improvement of the water-supply, has had a large share of the attention of the Local Boards, while in addition to this we have during the last four years allotted annually to each division the sum of Rs. 10,000 from Provincial funds as a grant in aid of this desirable object, and we have further during the past and the current years allotted special grants of one lakh of rupees for the same purpose.

5. We would further as regards "the cleansing of villages" point out that over the greater part of the Deccan and Southern Marátha country the caste of "Bhangis," which deals with the removal and disposal of night-soil, is non-existent; that even the large municipalities in those parts have the greatest difficulty in obtaining that class of servants, as is indicated in the latest report of the Sanitary Commissioner (paragraphs 124 and 140–144); and that it would be impossible for village communities to procure them.

6. As to the third proposition, that there exist "insanitary conditions which are undermining the health of the rural population," we would draw special attention to the able and lucid report by our Surgeon-General, and more particularly to his 15th paragraph, which, in our opinion, conclusively shows that there are other causes at work than "insanitary conditions" to account for the high death-rate prevalent in India—causes which have apparently not been considered by the sanitary authorities in England. Dr. Pinkerton's report as well as those of the Commissioners give, in our opinion, sound reasons why Miss Nightingale's proposals cannot be accepted.

7. As regards the application of the Village Sanitation Act it must be admitted that the difficulty as to the provision of funds pointed out is a real one, but for the removal of this difficulty we must look to the spread of education, and knowledge of the advantages of sanitation. Compulsory taxation under the Act can raise but a small sum, but there is no reason why in the course of time voluntary self-taxation by the villagers under the provisions of this Act should not supply adequate resources for the improvement of their condition. But for this a great advance in knowledge is necessary, and for that advance we must look to two sources: 1st, the constant pressure of the Government officials as advisers of the people and in their magisterial and executive capacity, and 2nd, that advocated by Miss Nightingale in her letters to the Poona Sárvajanik Sabha of 16th February and December 1881, viz., the influence of the educated classes as missionaries of sanitary reform. We, equally with Miss Nightingale, deprecate any increase of compulsory taxation in the cause of sanitation, and at the same time we would point out that while we are confident that, where it is feasible, Local Boards will willingly aid village Sanitary Boards, we consider that, local self-government being on its trial, it would endanger its successful establishment to interfere with the means it has at present for the supply of local needs.

8. In conclusion, we would request permission, Miss Nightingale's letter and accompaniments having been published in the Bombay newspapers, that our reply may be laid upon the Editor's table.

We have, &c.,
HARRIS.
G. R. GREAVES.
C. B. PRITCHARD.
H. M. BIRDWOOD.

DESPATCH from the GOVERNMENT OF INDIA to the SECRETARY OF STATE FOR INDIA, No. 3 (Sanitary), dated 30th May 1893.

MY LORD,

WE have the honour to forward for your Lordship's information copies* of our orders on the Sanitary Reports of the Local Governments and Administrations for the year 1891, and on the Vaccination Reports for 1891–92. Copies of these Reports have already been forwarded to your Lordship direct by Local Governments and Administrations.

2. In our Despatch No. 1 (Sanitary), dated the 13th January 1892, forwarding the Reports for the previous year, we described the steps which had been taken for the constitution of Sanitary Boards in the different provinces, and gave a summary of the law under which measures of village sanitation could be carried out in each province. Details of the working of these Boards during the year under report, and of the principal sanitary measures which have been carried out in municipal or rural areas, are given in the local Reports, and referred to in the Reviews of Local Governments and Administrations and our orders thereon. It is only necessary now to bring the account given in our Despatch of last year up to date by noticing briefly such changes of importance as have been carried out during the year, either as regards the constitution of Provincial Sanitary Boards or in the matter of special sanitary legislation for towns or village areas.

* Not reprinted.

3. In the Bombay Presidency the Sanitary Engineer, whose appointment was sanctioned in your Despatch No. 69 (Statistics), dated the 8th October 1891, was appointed shortly after the close of the year under report, and a Sanitary Board for the Presidency has now been constituted on a working basis. There is, therefore, at the present time a Provincial Sanitary Board in existence in every province, except in the Hyderabad Assigned Districts, where District Sanitary Boards have been created.

4. In our Despatch of January 1892 we informed your Lordship that no village agencies for the supervision of rural sanitation had been brought into existence in Bengal, and that we proposed to address the Local Government with a view to the formation of Union Committees under the Bengal Local Self government Act, III. of 1885. In the correspondence which ensued the Lieutenant-Governor expressed himself as altogether averse from creating Union Committees under the Act. The reasons advanced by his Honour induced us to agree with him that the general formation of such Committees throughout the whole area of the Province was at present impracticable or undesirable (to a great extent owing to the difficulty of providing these bodies with sufficient funds), but we were of opinion, especially in view of the fact that the Union Panchayets in Madras, which are similarly constituted, have done good work, that an endeavour should be made to constitute a few committees experimentally in selected and advanced rural areas in Bengal before deciding whether the system should or should not be more largely introduced. We have requested the Local Government to consider this suggestion.

5. Several important measures of sanitary legislation were undertaken or were in progress in the North-Western Provinces and Oudh during the year under the direction of the late Lieutenant-Governor, Sir Auckland Colvin. The local Village Sanitation Bill, designed to effect an improvement in the water-supply and conservancy of the larger villages, and to provide a means of checking the outbreak and spread of serious epidemics or infectious diseases in any district, was under consideration during the year, and has since been passed as Act II. of 1892. Among measures affecting municipal sanitation the North-Western Provinces and Oudh Water Works Act, 1891, was passed during the year, and two other measures—one providing for the construction and maintenance of drainage and sewerage works, and the other for the licensing of lodging-houses, in municipalities—were also introduced in the local Legislative Council. The latter has since been passed as the North-Western Provinces and Oudh Lodging Houses Act, 1892.

In the Punjab, the local Sanitary Board prepared a draft of a Village Sanitation Bill on the lines of the Village Sanitation Act in force in the Central Provinces (Act XIX. of 1889) and of that recently passed in the North-Western Provinces and Oudh. The draft has been referred by his Honour the Lieutenant-Governor to local officers and district boards for their opinion, and will be further considered when their replies have been received. A similar Bill was proposed to the Chief Commissioner of Burma by the Sanitary Board of that Province; but, in view of the recent introduction of the village system in Lower Burma, it was thought advisable to postpone its consideration till the close of the year.

6. We forward for your Lordship's information, as connected with the subject of sanitation, a copy of a Circular, No. $\frac{8 \text{ Sanitary}}{262\text{-}270}$, dated the 8th November 1892, which we have addressed to Local Governments and Administrations, recommending the system which prevails in the Madras Presidency of executing important sanitary works through specially appointed temporary Assistant Engineers working directly in subordination to the Sanitary Engineer and the Sanitary Board.

We have, &c.

LANSDOWNE.
G. S. WHITE.
P. P. HUTCHINS.
D. BARBOUR.
A. E. MILLER.
H. BRACKENBURY.
C. B. PRITCHARD.

Enclosure to above.

No. $\frac{8 \text{ Sanitary}}{262 \text{ and } 270}$.

From P. G. MELITUS, Esq., Officiating Depy. Secretary, to the Government of India, to All LOCAL GOVERNMENTS and ADMINISTRATIONS (except Madras), dated 8th November 1892.

SIR,

I AM directed to forward for

and for any action which may be considered necessary, the enclosed extracts (paragraphs 1 and 15 to 17) from a memorandum by the Army Sanitary Commission on the Madras Sanitary Report for the year 1890.

2. It will be seen that the Sanitary Board in Madras consists of two members, the Sanitary Commissioner, and a special Sanitary Engineer, attached to the Local and Municipal Departments of the Government, whose duty it is to act as adviser to municipalities and local boards in all matters relating to sanitary engineering. They work in concert, but each has his own especial functions. The Sanitary Commissioner deals with all questions of general sanitation; it is his duty to assist and advise local boards and municipalities in all matters which fall within his province, and to periodically visit all municipalities and advise the Government as to their sanitary condition. The Sanitary Engineer, acting under the orders of the Local Government, draws up and supervises the execution of schemes for improving the water-supply and drainage of municipalities, the conservancy of rivers

within their limits, and such other works of sanitary engineering as he may be deputed to investigate or carry out. He also assists local bodies generally in respect of the execution of minor sanitary works. No sanitary work, whether original or repair, estimated to cost more than Rs. 200 can be undertaken by any district municipality or local board unless the plans and estimates have first been approved by the Sanitary Engineer. The Sanitary Engineer has a permanent assistant who aids him in the preparation of schemes and carries on the current duties of his office when he is absent on tour. A valuable feature of the system is that for any important work or group of works a temporary assistant can be entertained at the charge of the municipality or local board to execute the project under the superintendence of the Sanitary Engineer.

3. The Government of India understand that these arrangements have been found very successful, so far as they have as yet been tested by experience. Water-supply schemes and other sanitary works of considerable magnitude are carried out under the direct supervision of the temporary Assistant Engineers, and the system has this special advantage, that the entire responsibility for such works rests with the Sanitary Commissioner and a competent Sanitary Engineer, instead of being distributed over the various municipal and district committees and local officers who are prevented by their own proper duties from devoting sufficient attention to the execution of sanitary improvements.

4. With reference to the extract from the memorandum of the Army Sanitary Commission relating to the sewage-farm system in the town of Madras, I am to enclose a copy of the report referred to and to request that the subject may be suitably noticed in the annual Sanitary Report.

I have, &c.

P. G. MELITUS,

Officiating Depy. Secretary to the Government of India.

DESPATCH from the GOVERNMENT OF INDIA to the SECRETARY OF STATE FOR INDIA, No. 6. (Sanitary), dated 28th February 1894.

MY LORD,

WE have the honour to forward for your Lordship's information copies* of our orders on the Sanitary Reports of Local Governments and Administrations for the year 1892, and on the Vaccination Reports for the year 1892–93. Copies of these Reports have already been forwarded to your Lordship direct by Local Governments and Administrations.

2. In our Despatch No. 3 (Sanitary), dated the 30th May 1893, we brought up to date the account we had previously given of the changes of importance which had been carried out as regards the constitution of Provincial Sanitary Boards, and in the matter of special sanitary legislation for towns or village areas. During the year now under consideration no further change took place in the constitution of Provincial Sanitary Boards. The question of reconstituting the Board of the North-Western Provinces and Oudh was under discussion in 1892, but it has not been altered. As regards the appointment of Sanitary Engineers to these Boards, concerning which your Lordship, in paragraph 3 of your Despatch No 13 (Statistics), dated the 17th August 1893, asked to be informed, we beg to refer to the despatches of the Secretary of State marginally noted, in which special Sanitary Engineers were sanctioned for Madras, Bombay, Bengal, and the North-Western Provinces and Oudh. In our Financial Despatch, No. 42, of this date, we have submitted a proposal for improving the status of the appointment of the Sanitary Engineer in Bengal. The proposal to appoint a Sanitary Engineer for Lower Burma has been abandoned at present for the reasons reported in our Despatch No. 7 (Sanitary), dated the 11th October 1893. The smaller provinces, though as yet without Sanitary Engineers, are watching the results of the experiments in sanitary administration which are being made by the larger Local Governments.

No. 69 (Statistics), dated the 26th September 1889.
No. 16 (Statistics), dated the 13th February 1890.
No. 103 (Revenue), dated the 27th October 1890.
No. 69 (Statistics) dated the 8th October 1891.
No. 9 P. W., dated the 16th March 1893.

3. As regards special legislation for the sanitary improvement of towns and villages, measures connected with this subject were before the local Legislative Councils of Bengal and the North-Western Provinces and Oudh. In Bengal provisions were introduced into the Municipal Act Amendment Bill to give effect to the recommendations of a conference held at Belvedere under the presidency of Sir Charles Elliott, with the object of introducing systems of improved water-supply and drainage; this Bill has been much discussed, and is still under the consideration of the Council. In the North-Western Provinces and Oudh, the Bill for the maintenance of drainage and sewerage works in towns was subjected to public criticism; the Select Committee of the Council appointed to examine and amend the Bill have lately submitted their report.

During the year 1892, the question of facilitating the construction of drainage works in rural tracts of country for improving the local sanitary conditions was brought forward by the Government of Bengal, and, as intimated in our Despatch No. 4 (Sanitary), dated the 7th instant, we have just sanctioned the introduction of a Bill for this purpose in the Bengal Legislative Council.

4. In our Despatch of the 30th May 1893, above mentioned, we informed your Lordship that we had requested the Bengal Government to consider the question of forming a few village unions under the Bengal Local Self-Government Act, III. of 1885, in order to test the system before deciding whether to abandon it or to extend it generally in that province. In the resolution of the Local

* Not reprinted.

Government reviewing the reports on the working of the District Boards in Bengal during the year 1882–93, it was stated that this question was under the consideration of his Honour the Lieutenant-Governor, and we have since learnt that arrangements are being made for constituting unions in several districts.

5. We take this opportunity to forward herewith a copy of our general orders* to Local Governments and Administrations, upon the principal suggestions which have been made from time to time by the Army Sanitary Commission, in their valuable Memoranda on the Provincial Sanitary Reports, and on the Reports of our Sanitary Commissioner. Your Lordship will observe that we have given consideration to all the recommendations of the Commission, and that we have adopted nearly all of them. The effect of the orders passed will not in all cases be fully perceptible for some time, but we trust that they will eventually result in considerable improvement in sanitation in India and in the method of reporting upon it.

We also forward copies of our Home Secretary's circular letter to Local Governments and Administrations, No. $\frac{5\text{-Sanitary}}{148\text{-}159}$, dated the 25th August 1893, containing instructions to District and Medical Officers, to be observed in investigating and reporting on the origin of epidemic disease in particular parts of the country, and of our Resolution No. $\frac{9\text{-Sanitary}}{266\text{-}275}$, dated the 13th December 1893, on the subject of the outbreak of cholera among pilgrims at, or returning from, great religious and other gatherings.

We have, &c.
ELGIN.
G. S. WHITE.
A. E. MILLER.
H. BRACKENBURY.
C. E. PRITCHARD.
J. WESTLAND.
A. P. MACDONNELL.

Enclosures to above.

No. $\frac{5\text{-Sanitary}}{148\text{-}157}$.

From C. J. LYALL, Esq., C.S.I., C.I.E., Secretary to the Government of India, to all LOCAL GOVERNMENTS and ADMINISTRATIONS; dated 25th August 1893.

SIR,

I AM directed to bring the following facts to in connection with an outbreak of cholera which recently occurred at a certain station, and to request that the instructions suggested in this letter for investigating and reporting on similar outbreaks of epidemic disease may be communicated to all district and medical officers in

2. In the case to which reference is made above, cholera broke out in a severe form at the station. The District Officers and the Civil Surgeon, who appear to have been on the spot at the time and should have had the best means of verifying what they reported, did not hesitate to state without any kind of qualification, that it had been established that troops from a certain locality had brought the cholera with them, and had not only disseminated it along the road, but were indirectly the cause of starting it in the cantonment, bazaar, and civil station. Further inquiry proved these facts to have been totally misrepresented, and showed that the troops in question, far from having brought the cholera into the district and station, were themselves the sufferers from an infection already existing there. The statements thus rashly made, and afterwards conclusively proved to be erroneous, attracted much attention both in England and in this country, and led to questions being asked in Parliament, and to comments in the public journals which had no foundation whatever in the facts of the case.

3. The Governor General in Council therefore considers it advisable to request that instructions may be issued to all Civil and Medical Officers whose position renders them liable to be called upon to make inquiry into the prevalence and causes of epidemic diseases, impressing on them the necessity for exercising the greatest care in the investigation of the facts connected with the outbreak and progress of such diseases, for scrutinizing most carefully the evidence on which these facts rests, and for refraining from giving expression to opinions not warranted by the facts established by the evidence.

4. In Home Department letter No. 199–202, dated the 19th September 1881, to the address of the Special Committee on Cholera in the Punjab, definite instructions were given for ascertaining the facts connected with the recent prevalence of cholera in that province. These instructions (with one or two very slight modifications) are reproduced below:—

"The following points may be noted as deserving of special attention:—

"(*a.*) The history of cholera in the locality—district, province, or other area affected—during the last few years.

"(*b.*) The date on which the first case appeared during the period preceding the outbreak under investigation; the circumstances connected with the appearance of the first case and with the subsequent progress of the disease; the number of towns and villages attacked; the number that escaped and the relative proportion between the two; the distribution of the

---

* Not reprinted.

disease by localities and by time as shown by the daily number of attacks; the relation which existed between the rise and fall of the outbreak in adjoining places, particularly in municipalities and cantonments.

"(*c.*) The circumstances connected with the rise, subsidence, and disappearance of the disease in any place, or in different parts of the same place, and also those connected with the escape or comparative exemption of other places in the neighbourhood. Under this head the sanitary or other local conditions of the places which suffered, and especially of those which suffered much, call for most careful investigation Among the more important of these conditions may be mentioned drainage, conservancy, water-supply, food, clothing, and the degree of overcrowding, if any existed. Where a severe outbreak was clearly associated with marked unsanitary conditions, the state of such places should be compared with the state of those which either suffered little or altogether escaped; the differences should be noted, and an endeavour made to ascertain what degree of correspondence existed between unsanitary conditions and the relative intensity of the disease.

"(*d.*) Endeavour should also be made to ascertain what were the exact meteorological phenomena of the year,—whether they presented any peculiarity, and whether this peculiarity appears to have had any relation to the outbreak."

5. The above instructions were given with special reference to the prevalence of cholera, but the Governor General in Council is advised that investigations into other epidemic diseases might also with advantage be made on similar lines. His Excellency in Council further desires that in the instructions which are now requested to issue it may be directed that such inquiries should always be of a purely practical character; that theoretical discussions should be avoided as far as possible; that, whatever conclusions are advanced should be based on the facts established; and that it should invariably be stated in the investigating officer's report on what evidence the facts accepted as established rest. It is hardly necessary to add that general statements made by villagers and subordinate officials, especially if much time has elapsed since the outbreak, should only be accepted after careful scrutiny.

6. It is a matter of considerable importance that inquiries regarding epidemic diseases should be instituted with the least possible delay after the outbreak is reported. It has been suggested to the Government of India that Civil Medical Officers should be directed to keep ready prepared and distribute beforehand a printed form of instructions in the vernacular (following the instructions given in this letter) for the use of all persons whose duty it would be to report the occurrence of cases of cholera.

I have, &c.
C. J. LYALL,
Secretary to the Government of India.

No. 9 Sanitary, 266—275.

Extract from the Proceedings of the Government of India in the Home Department (Sanitary), under date Calcutta, the 13th December 1893.

OBSERVATIONS.

In 1892 cholera made its appearance at the Hardwar fair in the month of March, and led to the assembly being dispersed. The return of the pilgrims to their homes in the Punjab was followed by a very severe and lamentable mortality from the disease, chiefly in the months of May, June, and July.

In 1893 towards the end of April the Government of India noticed statements in the newspapers that cholera had again appeared among pilgrims returning to the Punjab from the fair, which broke up on the 12th April. It seemed to the Governor-General in Council desirable that the opportunity should not be lost of making an immediate inquiry into all cases which might be reported—especially as throughout Northern India cholera was in the spring of 1893 quiescent to a very unusual extent —with a view to examine thoroughly the theory, which is one most frequently put forward, that great fairs like that at Hardwar act as *foci* of the disease, and that its appearance in any place may generally be traced to the return thither of pilgrims who have contracted it at such a gathering. Telegraphic orders were therefore issued to the Governments of the North-Western Provinces and Oudh and the Punjab, directing that prompt inquiry should be made by a competent officer of the Sanitary Department into all cases of cholera among, or alleged to have been introduced by, returning pilgrims; and those Governments were referred to the instructions given in a letter of the 26th June 1879 for the lines which the inquiry should follow.

2. In reply the Government of the North-Western Provinces and Oudh forwarded a report, dated the 2nd May, by the Sanitary Commissioner, who was himself present at Hardwar during the fair till the 17th April, or five days after the assemblage broke up. Dr. Hutcheson writes, "not a single "death from cholera was reported at Hardwar before, during, or after the fair." Brigade Surgeon Lieutenant-Colonel Jameson, Deputy Sanitary Commissioner, who was in executive sanitary charge of the fair, and left Hardwar after the pilgrims had dispersed, reports "No sign of cholera was seen "throughout the fair."

Cholera, however, had appeared in the Saharanpur District; on the 4th April three cases and two deaths from it had occurred at Roorkee among the 3rd Company of the Sappers and Miners, who had on the 1st arrived, after a long railway journey, from Nichu Guard in Assam. On the 14th

five returning Punjabi pilgrims were taken out of the train at Saharanpur with cholera. On receipt of a telegram by the Sanitary Commissioner on that date, close inquiry was made as to the existence of cholera in Hardwar, but no indication of the disease was observed there. On the 14th a doubtful case occurred at Jwalapur, three miles from Hardwar, but investigation proved that it was most probably not cholera; the patient was a Native Christian, who is said to have contracted colic and diarrhœa from a surfeit of green gram. On the 16th, however, there was an undoubted case of cholera, but this, too, was at Jwalapur, not at Hardwar. At Lhaksar, the station on the Oudh and Rohilkhand Railway, which forms the junction for Hardwar, there was a case on the forenoon of the 12th April on the railway premises.

The evidence is thus complete that at Hardwar itself, at the sacred sites and bathing pool, there was no cholera previous to the dispersion of the fair on the 12th April.

3. The Punjab Government has forwarded an interesting report by the Officiating Sanitary Commissioner, who has carefully inquired into all cases of cholera reported in that Province which occurred after the breaking up of the fair. Dr. Roe comes to the conclusion, that although there was no general outbreak of the disease, such cases as occurred in the districts of Umballa, Karnal, Delhi, Amritsar,* Jhang, and Montgomery were connected with the fair, and that cholera was introduced there by returning pilgrims. On the other hand, the disease appeared at Mian Mir, and in the Jullunpur, Gurdaspur, and Gujranwala districts, without any evidence to show a connection with Hardwar.

4. Dr. Roe's report has been examined by the Sanitary Commissioner with the Government of India in the Memorandum appended to this Resolution; and the Governor-General in Council considers that it is satisfactorily proved that, although returning pilgrims may have been in some cases the first to fall victims to the disease, there is no evidence that its spread in 1893 was due to them. The demonstrated absence of cholera at the site of the fair in that year would seem to show that Dr. Roe's theories as to its transmission by means of Ganges water carried home by pilgrims from the sacred pool are in this instance incorrect.

In 1892, as already observed, there was a very severe epidemic of cholera in the Punjab—the most severe for many years; and cholera had already appeared in an epidemic form at Hardwar before the fair was broken up on the 28th March. In his review of the Sanitary Report for 1892, His Honour the Lieutenant-Governor, on the facts stated in the report, has recorded his opinion that it is—

> "beyond a doubt that the cholera which prevailed from the end of March to the autumn in "the Punjab in the year under report was started by pilgrims returning from the Hardwar "fair. In paragraph 41 the Sanitary Commissioner expresses an opinion to the effect that the "climatic conditions of the year being favourable to cholera, there would probably have been a "widespread epidemic of cholera in the Province, even though the Hardwar fair had not been "held. In this, which is to a great extent matter of speculation, the Sanitary Commissioner "may be right, but there is no doubt that, as a matter of fact, the Hardwar fair started the "cholera, and that, as observed by Dr. Stephen, 'the mortality was, owing to the fair, much "'greater than it otherwise would have been.'"

As observed by Surgeon-Major-General Rice, the facts of the two years must be taken together. In 1892 cholera was present in the Punjab, in the Western districts along the Afghanistan frontier, before the fair. It was present at Hardwar in March; and it became epidemic throughout the Punjab in April, with a maximum of mortality in May and June. In 1893 the disease was singularly and unusually absent from the whole of Northern India. It was absent from Hardwar as from other places, and therefore could not have been disseminated from that place as a *focus*. Yet in April and May several cases occurred in the Punjab among returned and returning pilgrims, but the disease happily did not spread, and the general population, with few exceptions, remained free from it throughout the year. The Governor-General in Council agrees with Dr. Rice that the facts of 1893 do not point to the dissemination of a specific poison from a contaminated source, inasmuch as the poison did not exist at the source; yet the disease occurred among the pilgrims on, and during their return. It therefore seems most probable that its appearance in 1892 was due to causes similar to those at work in 1893, viz., those enumerated in paragraph 5 of the Surgeon-General's Memorandum, rather than to the dissemination of a specific poison.

5. Notwithstanding these conclusions, the Government of India will be glad if all Local Governments, and particularly those of the North-Western Provinces and Oudh and the Punjab, will arrange through their Sanitary Departments for the prompt investigation of all cases of cholera occurring after the dispersion of great religious and other gatherings, with a view to place the matter beyond doubt. The Governor-General in Council considers that good sanitation at the sites of the fairs, and suitable arrangements for medical relief on the routes homewards, are the only safeguards against outbreaks of disease to which experience points, and he has no doubt that Local Governments are alive to their importance. In the case of Hardwar much has already been done to provide those improvements which are required, and more is still in prospect. The attention of the Government of the North-Western Provinces and Oudh is, however, drawn to Dr. Rice's remarks regarding the station premises and their neighbourhood at Lhaksar, where some better sanitary regulations appear to be called for. Both at Lhaksar and Saharanpur it also seems probable that special arrangements for running through trains with returning pilgrims would obviate many of the delays which now lead to the crowding together of such persons detained at those stations, and thus render them particularly liable to the disease. The Government of India would be glad to learn

* Dr. Roe adds *Lahore;* but in this district cholera was present at Mian Mir among British troops before any cases occurred among natives returning from the fair.

whether, after communicating with the authorities of the Oudh and Rohilkhand and North-Western Railways, the Government of the North-Western Provinces and Oudh is able to affect any such arrangements.

(True extract.)

C. J. LYALL,
Secretary to the Government of India.

MEMORANDUM.

Dr. Roe's note corresponds very closely in its arguments with those put forward by Dr. Center in dealing with the outbreak of cholera which occurred in the Central Provinces in 1892, and was attributed by him to the introduction of the disease by returning pilgrims from the *Mágh Mela* at Allahabad, although at the *Mela* itself there was no cholera.

I think I showed in the latter case that the circumstances narrated did not warrant the assumption of the Sanitary Commissioner of the Central Provinces that the disease was imported and caused by returning pilgrims.

2. In the present case, I would first invite attention to the statement of the Sanitary Commissioner of the North-Western Provinces and Oudh, that in 1893 there was no cholera at all at Hardwar. The letters and telegrams from the collector of Saharanpur do not in any way establish the fact that Hardwar was the source of infection in April, although the disease was present in other parts of his district as well as in other districts in the North-Western Provinces before he wrote—as, for example, at Roorkee on the 4th April. The pilgrims taken out of the train at Saharanpur would, therefore, appear to have contracted the disease elsewhere, more probably at Lhaksar, where they are generally detained for several hours under very unfavourable circumstances, as explained by the Sanitary Commissioner. (I have myself witnessed, both at Lhaksar and at Saharanpur, crowds of pilgrims kept waiting for hours.) The pilgrims dispersed on the 12th April, and the Sanitary Commissioner, who remained on the ground until the 17th idem, found no case of cholera amongst them. How, then, could the pilgrims have contracted the infection at Hardwar?

3. Next, I would refer to Dr. Roe's statement in paragraph 14, that the disease appears to have been introduced into Lahore by returning pilgrims. In paragraph 13 he gives the date of the first case as the 10th May; but, in the next sentence in the same paragraph, he gives brief details of attacks on the 3rd and 5th of the same month, in three cases of Europeans, and two of Natives, in the Cantonment of Mian Mir, distant only three miles, between which and Lahore there is constant and free intercourse; just as the collector of Saharanpur sought to trace the infection to Hardwar, some 49 miles off by rail, while cholera was present long before at Roorkee only 22 miles distant from Saharanpur. The outbreak at Mian Mir was a widespread one, appearing in four widely separated parts of the Cantonment, and had established itself at least five days before the solitary case occurred at Lahore. The Europeans, at all events, had not been to Hardwar; under no circumstances, therefore, can the festival there be charged with having infected them. Moreover, not only had there been no cholera at Hardwar, as already pointed out, but the "returned pilgrim" at Lahore was attacked 28 days after the pilgrims had dispersed from Hardwar. With cholera previously present in Mian Mir, it is not reasonable to say the disease was introduced into Lahore by a pilgrim returning from Hardwar so long after he had left that place, as is done by Dr. Roe in paragraph 14 of his report.

4. The same sort of criticism can be applied to almost every case cited by him.

He expects us to believe that pilgrims returning to Umballa will infect that place, while those returning to the next district, Jullundur, will leave it alone; that others will infect Amritsar, but pass over Mian Mir, and then infect Lahore—all five places being on a direct line and next to each other in the order given. I submit this is expecting too much.

5. Now the history of the annual outbreaks of cholera in the Punjab shows for the last six or seven years—and for how many before I cannot say—that in February, March and April there are sporadic cases, and that it is not till May or June that it assumes an epidemic form.

It is accepted as a general rule that new comers to any locality are more susceptible of local infections than continuous residents, and that persons of lowered vitality from any cause possess more feeble resisting power than those in their ordinary good health.

Therefore, it appears to me more reasonable to assume that returning pilgrims, weakened as they are by exposure to the hot sun by day, and chills by night, by the use of badly cooked and stale food, by drinking on the journey such water as they come across, by the fatigues of long journeys on foot, which many of them make instead of taking the railway, or by the detentions of several hours in great crowds at junction stations, such as Lhaksar and Saharanpur, should, if they have not already contracted infection on the journey, be the first to be attacked on their return home by this early sporadic form. It cannot but be that there must be many already weakly persons among the numerous bodies of pilgrims setting out on pilgrimages who must be further weakened by exposure to the hardships described above, and one would expect to find such persons among the first to be attacked when they are subjected to an infection, whilst the residents of the place may be able to resist the disease as long as it has not acquired sufficient intensity to become epidemic.

6. That these remarks are something more than speculations may, I think, be admitted, when we have Canailis and Murpurgo showing that, by means of *starvation*, animals can be made to lose their immunity from certain infective diseases. Hankin shows the same from *unsuitable diet*. Charrin and Roger prove that loss of immunity occurs from *fatigue* and *over exertion;* Pasteur, Petruschky,

Fermi, Salsano, and others, that *heat, cold,* and *wet* produce the same results. Supposing cholera to be an infective disease, we may expect pilgrims, who suffer more or less from one or more of these causes of susceptibility, to be especially liable to contract it.

It is stated by Dr. Roe that many of those attacked had been absent from their homes for several weeks, so that when they returned they may be said to be, in a sense, new comers, and, in addition, just off travels made under the unfavourable circumstances above described.

7. The observations of 1892, combined with those of 1893, afford an excellent example of the "method of differences." In both years, pilgrims returning from Hardwar were (it is alleged) in many districts of the Punjab the first to be attacked. In 1892 the first attacks were followed by a very severe and lamentable mortality throughout the general population, cholera having (though previously prevalent in the western districts adjoining Afghanistan in January and February, and having already spread westwards into Afghanistan long before the outbreak of March (been quiescent in the Punjab between the 7th February and the 24th March, when the fresh cases occurred almost entirely among returning pilgrims. In 1893, likewise, cholera which was quiescent in the early months of the year, occurred again in March among returned pilgrims, but owing probably to different meteorological conditions—the spring of 1892 having been very hot and dry, and that of 1890 very moist and cool—no considerable spread of the disease took place.

8. My own opinion is that the epidemic of 1893 was but the recrudescence of that of 1892, as is now happening in Europe, and has happened over and over again in past years in the different Provinces of India. Just as this year's outbreak in Europe was preceded by sporadic cases, so it was in the Punjab, the Central Provinces, and other places.

9. Dr. Roe gives us a long dissertation on the power of Koch's vibrio to maintain its potency for infection. I am not a bacteriologist myself, but I have read papers by persons who are distinguished as such, in which the causative power of Koch's vibrio is denied. And I find some confirmation of this in the fact that at Hamburg last year a great number of fatal cases occurred in the first few days, in which the best German bacteriologists engaged failed to find the bacillus, and, therefore, declared the outbreak not to be Asiatic cholera; it was *cholera nostras*, according to their views, up to the date on which they found the bacillus, after which it became true cholera. In the meantime no preventive measures had been taken, although the *cholera nostras* (so called) was in its clinical aspects quite indistinguishable from, and was quite as rapidly fatal as, the Asiastic variety. Could anything serve as a better warning to us to be cautious in acting on the speculations of bacteriologists?

10. Take, for instance, paragraphs 16 and 17, in which Dr. Roe refers to the experiments of MM. Trenkmann, Nicati, Rietsch, and others. Dr. Roe appears to be in error when he states that "the Marseilles water was strongly saline and charged with organic matters"; on the contrary, it had been sterilised before having been experimented on. It is well known that the cholera spirilli multiply rapidly in sterilised water, whereas in unsterilised water—in other words in the presence of other specialised bacteria—they die out in the course of three or four days.

Again, in paragraph 17, Dr. Roe states that "if the dejecta from a case of cholera are sprinkled "on moist soil or damp linen, etc., etc., the comma bacilli increase at an enormous rate for the first 24 "or 36 hours," etc., etc. This is almost a verbatim quotation from Dr. Sims Woodhead in "Bacteria and their Products," but stops short in the middle. The remainder of the quotation is as follows:—"But on third or fourth day the specific organism begins to die out, and other bacteria are "found to be asserting themselves most strongly." In these extracts Dr. Roe expresses himself, unwittingly, of course, to the risk of being taken to task for suppressing passages adverse to the point which he desired to prove. The Ganges water is probably never free from numerous distinct kinds of bacteria, which have a destructive effect on the cholera vibrio, by simply crowding it out.

It is seldom that pilgrims reach their homes within three or four days of their departure from Hardwar, by which time the cholera spirilli have died out or been destroyed by the other bacteria, both in the clothes and the Ganges water.

As regards sweetmeats, it is to be remembered that Sternberg declares the thermal death-point of the comma bacillus to be 52 C., equal to 125·6 Fahrenheit. Surely sweetmeats are subjected in cooking to a very much higher temperature than this.

Dr. Roe's quotation from Trenkmann is wanting in fulness and is scarcely accurate.

11. I insert a cutting from the advertisement sheets of the *Pioneer* of the 12th instant, from which a pretty fair notion may be obtained of what has been done at Hardwar already in effecting sanitary improvements, and what it is proposed to do in future as funds are available.

W. R. RICE,
Surgeon-General.

20th October 1893.

Extract from the "Pioneer" of the 12th October 1893.

The great Mahabarni Fair at Hardwar was broken up last year on account of an outbreak of cholera. Hundreds of thousands of pilgrims who were on their way to the fair were turned back, and naturally enough they were greatly disappointed.

By order of Government a committee was assembled at Hardwar early in January in order to consult and advise Government on the measures which ought to be adopted for the prevention of cholera at the Hardwar fairs. The committee consisted of eight members, of whom five were Hindus, and after careful inquiry certain proposals were made, which were supported by the unanimous recommendation of all the members, and by the assent and approval of those residents of Hardwar who are chiefly interested. Two of the most pressing improvements suggested, related to the sacred pool at Harki-pairi, and to the Bhim-goda tank, and these were at once taken in hand by the Government, and have now been completed at a cost of over ₹80,000, which amount has been paid by the Government.

The remaining recommendations are numerous and important, and will cost a sum of money which will certainly exceed some lakhs of rupees. There is no doubt that these improvements ought to be carried out, but funds cannot be supplied from provincial sources, and it is therefore hoped that Hindus who are interested in the sanitation of Hardwar will co-operate by subscribing to a fund which has already been started for defraying the cost of the new works.

Some of the most pressing of the proposed improvement are the following:—

(1.) The protection of a river front by an embankment at all points where water is likely to become stagnant. For this improvement alone a sum of ₹20,000 is required.

(2.) The improvement of the drainage of Hardwar and Kankhal on a general plan, and the connection of all drains with the main drain. The plan is under preparation, and the cost of carrying out the work will be very heavy.

(3.) The laying of a tramway for the removal of city rubbish and night-soil beyond the inhabited area of Hardwar. This work is also a very extensive one.

(4.) The improvement of the drainage of the town of Jwalapur, which is close to Hardwar and Kankhal, and in which thousands of pilgrims take up their abode on the occasions of fairs.

(5.) The paving and metalling of lanes and roads in all the three towns of Hardwar, Kankhal, and Jwalapur.

The Union Municipality of Hardwar has for many years been spending as much of its income as was available on improvements, such as the pucca embankment, which has been constructed from the Harki-pairi pool to the Gau Ghât, at a cost of ₹14,158, but as its income is comparatively small, it cannot possibly undertake the principal improvements such as those already mentioned.

The Hardwar Hindu Committee, therefore, earnestly hopes that this appeal will meet with a liberal response from the many wealthy Hindus who are so deeply interested in the sacred city, and the well-being of the thousands of pilgrims who flock to it from all parts of India.

DESPATCH from the GOVERNMENT OF INDIA to the SECRETARY OF STATE FOR INDIA, No. 8 (Sanitary), dated 28th March 1894.

SIR,

WE have the honour to reply to Lord Cross's Despatch No. 22 (Statistics), dated the 14th April 1892, with which was forwarded, for our consideration and for any remarks we might have to make, a copy of a letter from Miss Florence Nightingale, with enclosures, relative to the application of village cesses to the purposes of sanitation.

2. Miss Nightingale enclosed a copy of a memorandum signed by certain members of the Indian Committee of the last International Congress of Hygiene and Demography, in which the following propositions were stated, viz.:—(1.) That the insanitary condition of the rural villages in India is a very serious evil; (2) that active measures are required to obviate the existing injury to public health; (3) that as regards villages in the Bombay Presidency funds are raised by village cesses for works of local public utility, including sanitary improvements, but the amount spent in actual cleansing operations in the villages is very small indeed compared to the amount raised by the village cesses; and (4) that the removal of the present sanitary evils in the rural villages is the first necessity as regards those villages, and reasonable sanitary improvements in each village should be regarded as a first charge on the cess raised in that village, the claims for any general purposes—such as good local communications—being postponed until the minimum of sanitation has been completed, *i.e.*, while typhoidal or choleraic disease is still prevalent.

Miss Nightingale inquired whether, in accordance with the recommendations contained in the memorandum, it might not be possible for the local authorities under the existing law to cause sufficient funds to be appropriated to satisfy the minimum requirements of village sanitation. She quoted the opinion of the Poona Sarvajanik Sabha to the effect that the Bombay Village Sanitation Act, 1889, had failed to produce the desired results, because the Act did not reserve a definite portion of the village cesses to meet the expenses of sanitation—the rural population being too poor to be further taxed; and she suggested that the village organizations should be primarily vested with the administration of the funds raised by village cesses for village sanitation.

3. With his Despatch No. 4 (Statistics), dated the 14th April 1892, Lord Cross also forwarded, direct to the Government of Bombay, a copy of Miss Nightingale's letter, with enclosures, to which that Government replied in their Despatch No. 22, dated the 2nd September 1892. In the meanwhile we consulted local governments and administrations as to the application to other provinces of the suggestions made in the correspondence, and we now enclose a copy of the replies which we have received.

4. The Government of Bombay have pointed out that sanitation was not originally one of the objects of the local cesses raised in that Presidency; and it will be observed as regards other provinces, where different forms of local taxation obtain, that nowhere was it in former times the custom in this country to expend such cesses on village sanitation, and that no funds which have been intended by law for this object have been diverted to other more general local purposes. Moreover, we agree in the opinion expressed in the despatch of the Government of Bombay, and generally by the local authorities throughout the Empire, that village sanitation should not, in the existing circumstances, be a first charge upon local or village cesses. We consider, for the reasons which we shall give, that roads, schools, postal facilities, and dispensaries must continue to be held to be of primary importance.

5. We are convinced that village sanitation in India is a matter which requires to be handled with very great caution, and that the habits and prejudices of the people must be most carefully considered in taking action to improve it. The great majority of the inhabitants in the interior of the districts are not sufficiently educated to be expected to relinquish immemorial practices, which, though opposed to modern sanitary principles, do not seem to them to be objectionable. The people are, however, rapidly growing in the appreciation of the benefits of good communications, of elementary education, and of medical relief, which appear to them to be much more desirable than sanitation. Great and universal dissatisfaction would unquestionably be produced by the withdrawal from these objects of the local funds which are now spent on them, in order to press measures of sanitary reform among an unwilling and conservative people. For this reason, among others, we are entirely opposed to general schemes for the improvement of village sanitation, such as that put forward, which are framed without due consideration of the conditions obtaining in this country, and the sentiments of the people.

6. It is pointed out by several of the authorities consulted that, if the local roads, schools, posts, and hospitals were entirely neglected and the funds now spent on them made available for expenditure in the villages wholly on cleansing operations, the amount which could be spent in each village would be too trivial to make any appreciable impression upon the insanitary conditions, whilst to place these sums in the hand of the ignorant villagers would lead to waste, and would thus prevent the chance of success of any sanitary schemes that might be introduced. There is force in these objections; but, without binding ourselves to the statement that the ordinary village organisations, where they exist, cannot at the present time be turned to good account for purposes of sanitary improvement of a simple kind, we have no doubt that much is not to be expected of them until education has induced, among the general population, some desire for more healthy habits and some knowledge of the true principles which should be followed. In all primary schools an endeavour is made in this direction by requiring the laws of health to be studied in an elementary form; and in the process of time it may be hoped that some effect will thus be produced.

7. To say, as is said in the memorandum, that the present insanitary conditions of the villages are undermining the health of the rural population, seems to us to be using the language of exaggeration. These conditions, as they at present exist, are probably better than those which have existed for many centuries; and it appears to us that the general increase of the population which has been demonstrated by several successive censuses, sufficiently shows that much has already been done to remove those natural checks (among which disease held a chief place) which till recent times operated as a hindrance to its growth.

8. We have from time to time informed the Secretary of State of the progress of sanitary improvement in this country. In the Home Department Resolution, dated the 27th July 1888, a copy of which was forwarded with the Despatch No. 11 (Sanitary), dated the 11th August 1888, from Lord Dufferin's Government, the position of affairs and the views of the Government of India upon the subject were set forth at length, and our Despatches, ending with No. 6 (Sanitary), dated the 28th ultimo, forwarding copies of the orders of the Government of India upon the Annual Sanitary Reports of Local Governments and Administrations, have brought the accounts previously given regularly up to date. In our opinion the provision of a good water-supply is the first essential of sanitary improvement in this country, and it is almost the only one which at present meets with general appreciation from the people; in this matter Local Governments and Administrations are generally making considerable advances, and several special Acts have been passed to facilitate further improvements. The drainage of large water-logged tracts, to which we also attach great importance, is, so far as financial considerations allow, being arranged under the skilled supervision of the Provincial Sanitary Boards, and a measure of legislation with this object is at present engaging the attention of the Council of the Lieutenant-Governor of Bengal. Village conservancy of a simple nature has been introduced in some parts of the country, notably in the Central Provinces; but there are great difficulties in this branch of the subject, the chief of which is that of securing proper control and supervision and the prevention of oppressive action.

9. We are conscious, nevertheless, that very much remains to be done. Though all Local Governments and Administrations are paying attention to the subject, and the effectiveness of their attention will increase with time, we think that in some provinces more might be done without delay. Sanitation in its simplest form of a pure water-supply and simple latrine arrangements should, it seems to us, be regarded as having to some extent a claim on provincial revenues, and we intend to press this claim upon Local Governments and Administrations as opportunity offers. In the meantime our views are generally those expressed by the Government of Madras, viz., that all that can be done is to await the development of local sanitation in India upon existing lines.

We have, &c.,

ELGIN.
A. E. MILLER.
H. BRACKENBURY.
J. WESTLAND.
A. P. MACDONNELL.

DESPATCH from the GOVERNMENT OF INDIA to the SECRETARY OF STATE FOR INDIA, No. 15 (Sanitary), dated 12th December 1894.

SIR,

WE have the honour to acknowledge the receipt of your Revenue Despatch No. 134, dated the 20th September 1894, in which you request to be furnished with certan further papers indicated by Miss Florence Nightingale on the subject of village sanitation in India, and inquire whether in our opinion it would be advisable to present the papers to Parliament.

2. Miss Florence Nightingale inquires:—

(*a*) what was the outcome of the Conference to be held in July 1892 at Belvedere of engineering and sanitary experts with representative natives of Bengal; and who were these representative natives?

(*b*) what was the result of the inquiries which were being made in the Punjab in December 1893 into the question as to the connection existing between a water-logged soil and malarial fever? and

(*c*) what progress has been made in the organisation of village unions?

3. The proceedings of the Belvedere Conference, and connected correspondence, were forwarded to Lord Kimberley's address with our Sanitary Despatch No. 4, dated the 7th February 1894. A reference to the Bill introduced into the Legislative Council of the Lieutenant-Governor of Bengal, which accompanied that despatch, and to Bengal Act IV. of 1894, which was forwarded with His Excellency the Governor General's Despatch No. 22 (Legislative), dated 14th August 1894, will show that the principles accepted by the Conference have received much attention.

The subject to which Miss Florence Nightingale's second question relates is referred to in paragraph 11 of the Resolution recorded by the Lieutenant-Governor of the Punjab on the Report on the Sanitary Administration of that Province for the year 1893. We have drawn the attention of the Punjab Government to the necessity for the prosecution of drainage schemes for water-logged tracts, where fever has been specially fatal during recent years. A copy of our letter* is enclosed.

Home Department No. 258 (Sanitary), dated 22nd September 1894 (*vide* paragraph 6).

We explained in our despatches marginally noted that the question of forming village unions experimentally in selected and advanced rural areas in Bengal was being considered. From the Resolution* recorded by the Government of Bengal, No. 3600-L. S. G. dated the 1st September 1894 (a copy of which is enclosed), it will be seen that the Lieutenant-Governor has taken steps for the establishment of union committees in localities which offer the best conditions for their success.

Home Department No. 3 (Sanitary), dated the 30th May 1893 (paragraph 4.
Home Department, No. 6 (Sanitary), dated the 28th February 1894 (paragraph 4).

The reports and resolutions for the different provinces on the working of the Local Boards for the year 1892–93, which have already been forwarded to you in accordance with paragraph 7 of the Secretary of State's Despatch No. 114 (Statistics and Commerce), dated the 11th September 1879, contain the latest information upon the subject of village unions in other parts of India.

4. Miss Nightingale has also asked to have copies of the opinions of the sanitary authorities in all the provinces. Such opinions are already contained in some of the annual sanitary reports, and we are requesting the Local Governments and Administrations to arrange that in future important declarations of opinion by the Sanitary Boards upon the subject of village sanitation may be invariably mentioned in the reports.

5. We see no objection to the papers on the subject being presented to Parliament.

We have, &c.
A. E. MILLER.
J. WESTLAND.
A. P. MACDONNELL.

DESPATCH from the GOVERNMENT OF INDIA to the SECRETARY OF STATE FOR INDIA, No. 3 (Sanitary), dated 6th February 1895.

SIR,

WE have the honour to forward, for your information, copies* of our orders on the Sanitary Reports of Local Governments and Administrations for the year 1893 and on the Vaccination Reports for the year 1893–94. Copies of these reports have already been forwarded to you direct by Local Governments and Administrations.

2. In the orders above quoted we have specially drawn the attention of Local Governments and Administrations to the more prominent suggestions and recommendations of the Army Sanitary Commission made in their memoranda on the reports of the Provincial Sanitary Commissioners for the year 1892 to which you invited our attention in paragraph 2 of your Statistical Despatch No. 1, dated the 19th July 1894. In paragraph 3 of that Despatch, in connection with the increase of mortality in the Punjab, you referred to the necessity of pressing forward the prosecution of drainage schemes for water-logged tracts. The action taken by us in this matter was reported to you in our

* Not reprinted.

Sanitary Despatch No. 15, dated the 12th December 1894, in which we also referred to the progress which was being made in connection with village sanitation in India. We enclose a copy* of the marginally noted letter from the Government of Bengal which reports the orders passed by the Lieutenant-Governor to give effect to the suggestion which was made by the Army Sanitary Commission with a view to obtaining more reliable records of the amount of success attending the operations of vaccinators in that province.

* No. 28 S., dated the 5th January 1895, and enclosures.

3. During the present year certain changes have been made in the constitution of the Sanitary Boards in Madras and Bengal. In the former province the Sanitary Board has been strengthened by the addition as President of the Chief Engineer of the Public Works Department. The rules which regulate the working of the Board have also been revised. In Bengal the title of the Engineer to the Sanitary Board has been changed to that of Sanitary Engineer, Bengal. This officer has been appointed *ex officio* Secretary to the Board, and his powers and duties under the rules have been more clearly defined. Copies* of the proceedings of the Governments of Madras and Bengal in this connection are enclosed.

* From the Government of Madras, No. 2281 L. (Local and Municipal), dated the 16th November 1894, and enclosures.
Resolution recorded by the Government of Bengal, No. 3456 S., dated the 21st August 1894, with rules attached.

4. We also transmit, for your information, a copy of a Resolution which we have issued to Local Governments and Administrations on the subject of the registration of vital statistics. We have requested each Local Government and Administration to consider carefully its existing machinery for the collection and collation of these statistics and to report what improvements are possible and how it is proposed to give effect to them. We trust that this will lead to greater improvements in the registration of births and deaths in those provinces in which registration is still unsatisfactory.

No. $\frac{\text{Sanitary}}{106\text{-}117}$, dated the 18th June 1894.

We have, &c.
ELGIN.
G. S. WHITE.
A. E. MILLER.
H. BRACKENBURY.
C. B. PRITCHARD.
J. WESTLAND.
A. P. MACDONNELL.

Enclosure to above.

No. $\frac{\text{2 Sanitary}}{106\text{-}117}$.

Extract from the Proceedings of the Government of India in the Home Department (Sanitary),— under date Simla, the 18th June, 1894.

RESOLUTION.

The Famine Commissioners in their Report of 1880 laid much stress upon the necessity for improvement in the registration and reporting of births and deaths throughout the country as a means of testing the condition of the people and the progress of epidemics by indicating the localities of the severest pressure from want and from the diseases that accompany and follow upon want. The Government of India pointed out that both famine and pestilence should be known to the District Officers long before they can be put in possession of any figures of vital statistics calculated to reveal the existence of either, but that the punctual collection and early collation of vital statistics are of the utmost importance in enabling those responsible for the administration of the country to use them as tests of the general information which the local officers acquire in other ways, and as aids in forming a correct estimate of the areas affected by calamity and of the growing intensity of famine or disease.

2. The Famine Commissioners advised that the propriety of making the registration of births and deaths legally obligatory in villages as well as in towns should be considered by the Government in each province, and that, if it were found practicable to make it obligatory, this should be done. The Government of India, however, agreed with the general opinion of the Local Governments and Administrations that the extra-municipal villages and outlying tracts were not yet ripe for a compulsory system, and that the development of registration upon existing lines should be awaited.

3. The Government of India have every year devoted considerable attention to the subject in reviewing the annual Sanitary Reports of the different Local Governments and Administrations, but it seems to the Governor General in Council that, as the reports of the Census of 1891 have now been before the public for some time, the present is a suitable opportunity for reviewing generally the work done in registering births and deaths since the issue of the Resolutions quoted in the preamble, by a comparison of the results so obtained with the figures furnished by the Census.

4. The population at the end of any period is equal to the population at the beginning of the period, plus the gain by births and immigration, minus the loss by deaths and emigration. Thus the result of the number of births registered in 1881–90, less the number of deaths registered in those years, together with the addition or defect due to the balance of immigration or emigration, should, when conjoined with the figures of the Census of 1881, agree with the figures of the Census of 1891. The test is not, however, a perfect one, as an error, giving an excessive number of births or

* Not reprinted.

immigrants may be obscured by another error giving a corresponding deficiency of deaths or emigrants. Moreover, the area in which births and deaths are registered is less than the whole area for which the Census is taken, and has changed somewhat from year to year, so that the figures are not exactly comparable. Again, it has not been found possible to determine accurately the number of immigrants and emigrants, who have come into or left the different provinces during the decade; in most provinces this is ascertainable only as an inference from the Census figures showing persons born out of the province who were enumerated in it on the Census night.

5. Nevertheless, it appears to the Governor-General in Council that a comparsion of the results of the registration of births and deaths of each province with the Census figures and with the results in other provinces can be made with sufficient accuracy to indicate generally where there has been progress or retrogression in registration. The appended Statement I. compares the figures obtained by the Censuses of 1881 and 1891 with the numbers of births and deaths registered during the decade in each province. Statements II. (*a*) and (*b*) show provincial birth and death ratios per 1,000 deduced from the number of registrations for each year from 1881 to 1892, inclusive.

6. The Census Reports show that the provinces which have gained by immigration are Assam, Lower Burma, the Punjab, Bombay, the Central Provinces and Berar, and the provinces which have lost by emigration are Bengal, Madras and the North-Western Provinces and Oudh. Assam is estimated to have gained nearly 400,000 persons during the decade, most of whom were adults and 42 per cent. of whom were women; probably about 80,000 of this number died in the country during the ten years in question. During the ten years 1881–90 some 132,000 persons (of whom only about 20 per cent. were women), it is estimated, emigrated from India to Lower Burma, and of these probably about 23,000 died during the decade. Besides these immigrants, there was a very large exodus from Upper Burma before the war in 1885–6, in which the women probably equalled the men. It is not possible from the Census figures to estimate the gain on account of immigration from Upper Burma to Lower Burma, as the tables of the enumeration of 1891 do not show the figures separately for the two parts of the province; it is likely, however, that of late years a large number of the immigrants from Upper Burma have returned to their previous homes. The Punjab Census Superintendent says that by a rough guess it may be taken that there was a total gain during the ten years to his province of about 200,000 persons; he surmises that a considerable proportion of this number was due to the marriage of Punjabi husbands with wives from the North-Western Provinces and Oudh, but that on the whole the majority of the immigrants were males. The Census Superintendent for Bombay estimates that in 1891 there was a gain by that Presidency since 1881 on the balance of immigration and emigration of some 108,000 persons, of whom about 33 per cent. were women; this does not include the number of immigrants who died during the decennium. The Census Report of the Central Provinces shows that, exclusive of the immigrants who died between 1881 and 1891, there was a net gain of over 30,000 persons by immigration; the Central Provinces lost some 164,000 persons, amongst whom women were to men as 7 to 5, to Berar; these provinces, on the other hand, gained some 110,000 persons from the North-Western Provinces and Oudh, of whom only about one-third were women, and about 74,000 from the Central India States, amongst whom women were to men as .994 to 1,000. The Hyderabad Assigned Districts gained on immigrants from the Central Provinces and lost on emigrants to the Nizam's dominions; the net result being a gain of about 15,000, not including those who had died, in which the females probably slightly exceeded the males. The net loss of population caused by emigration in Bengal during the decade is estimated by the Superintendent at 327,527, of whom he says a little more than one-third were females; the emigration was chiefly to Assam and Burma. In Madras it is reported that the province lost on the balance of immigration and emigration some 250,000 persons by sea and 50,000 by land; the proportion of women is not given, but it appears that a very large part of the emigrants were adult males. The Census Superintendent of the North-Western Provinces and Oudh estimates that during the decade 232,985 persons, of whom only 80,745 were women, emigrated from those provinces in excess of those who came into them; he adds that a very large proportion of the emigrants were adults.

The first effect to be noticed of immigration or emigration during a decade between two censuses upon birth and death ratios is that, as no addition or deduction is made on this account to or from the population upon which the ratios are calculated, immigration to a province causes the ratios to be somewhat higher than they otherwise would be, whilst in provinces where there is a balance of emigration the reverse is the case. Then the real effect of immigration or emigration upon births and deaths depends not only upon the number of immigrants or emigrants, but upon their ages and sexes. Thus, when the immigrants to a province are mostly adults, they should die at a rate very much less than the normal rate for persons of all ages; but, for the reason given above, every death amongst them, if reported, will increase the death ratio of the province until the next census is taken; after that, they would tend to bring the ratio below the normal. The converse is the case in a province from which there is emigration. As regards births amongst immigrants, the numbers will depend chiefly on the women of the reproductive ages; every birth reported amongst them will, however, increase the ratio of the province until the next Census is taken; after that the ratio of the province for births will be increased or decreased according to the proportion and ages of females amongst the immigrants. The effect of the emigration of a considerable number of adult males from a province would seem to be to decrease the number of births in that province slightly and for a short time only.

7. Broadly, after making such allowances as are possible on account of immigration and emigration, it appears from Statement I. that in the North-Western Provinces and Oudh, the registration of births and deaths is performed with an approach to accuracy, whilst in the Central Provinces, the Punjab and the Hyderabad Assigned Districts, the work is fairly well done. Bombay, Madras, and

Assam, come a long way after the provinces named as regards the sufficiency of the returns. The figures for Burma show that there has been very great inaccuracy in that province. As regards Bengal, the circumstances are peculiar: no village agency exists in that province, and for this reason, until 1892 births were not registered outside towns.

8. In Statement II. the ratios have been calculated, not upon the total population of the province, but upon the population returned in the different Sanitary Reports as under registration. The ratios for the years 1881–90 are calculated upon the Census of 1881 of the areas under registration; the ratios for the years 1891 and 1892 are calculated on the Census of 1891 of those areas, with the ratios according to the previous Census shown in italics below them. The Census of 1891 shows that there has been a general increase in the population of India since 1881, which is estimated by the Census Commissioner for India (page 73 of his Report) at an annual rate of 9·30 per 1,000 in British India. So that, even if the registration of births and deaths were uniform in accuracy throughout the period under review, this increase of population would cause an annual ascent in the ratios till the following Census, as they were calculated on a population less than actually existed during the greater part of the decade. It has been suggested more than once that the ratios should be calculated each year upon the population as found at the last Census, plus an assumed annual increase, as is done in England and some European countries; but the Government of India and the Secretary of State are of opinion that this cannot usefully be done until at least another Census has been taken and data extending over a sufficient number of years are obtained.

9. The Census Commissioner for India estimates from the age returns (pages 61 and 282 of his Report) that for the whole of India the average annual birth rate reaches nearly 48 per 1,000 and the death-rate about 41 per 1,000. The ratios in Statement II. are throughout considerably below these figures. There the ratios for births are highest in the Hyderabad Assigned Districts and the Central Provinces. In the Central Provinces, however, they show some falling off towards the end of the period under review. In the North-Western Provinces and Oudh, where the figures were high at the beginning of the period, there has been retrogression rather than advance, the ratio of 43·78 in 1884 declining to 33·26 in 1891. In the Punjab there is a want of sustained improvement; no year since 1884 has reached the figure (42·98) attained in that year, and in 1891 the ratio fell to 34·02. In the Bombay Presidency there has been a fairly sustained rise. In Madras the increase has been slight and not well maintained. In Bengal, where, as the figures are for municipalities only, greater accuracy should have been found than elsewhere, the ratios are not only behind those of the other large provinces, but have during the last seven years shown, except 1892, been retrogressive. Assam shows a well-sustained improvement, but this is probably due largely to the increasing number of male and female immigrants of the reproductive ages who come into the province every year. In Burma there has been some improvement, yet the figures are still the worst in the whole of India. The Governor-General in Council is well aware that the true birth-rate throughout India is not constant, and that in the provinces of Madras and Bombay, as remarked by the Census Commissioners, a special stimulus was given to it some years ago owing to the depletion of large tracts by famine prior to 1881. In other provinces where the increase of population in 1891 was found to be below the average for the whole Empire, it was not to be expected that the highest ratios would be maintained. It seems to His Excellency in Council, nevertheless, that where there are considerable variations and decreases, such as have been pointed out, it behoves the local authorities to endeavour to arrive at the real explanation of them.

10. The ratios of deaths show considerably more improvement generally than those of births. There have been no extensive famines or epidemics during the period under review, and the Government of India consider that the figures demonstrate that a distinct advance is being made in the registration of mortality throughout the country. Still, in many provinces, it is evidently far from approaching the truth. The Punjab has the highest figure of late years, viz., 49·48 in 1892, which is known to have been a particularly unhealthy year, but the ratio in the previous year was only 29·13; in the years 1881–86 the death-rate in that province was shown much below what it must have been. The Hyderabad Assigned Districts showed the highest figure of all (51·36) in 1883; but the ratio for the next year was returned at 24·64, and for the last five years in the table the ratios have been 24·75, 42·57, 35·50, 40·68, and 28·91, exhibiting variations for which the Government of India are unable to find a sufficient explanation. In the North-Western Provinces and Oudh and the Central Provinces the death ratios are fairly high; in the former provinces they are tolerably well-sustained, whilst in the latter they are somewhat variable. In Bombay they have fluctuated, but have on the whole improved. In Madras they were lower in the early years of the period than elsewhere (except in Lower Burma), and have improved little since. In Bengal the figures are still low, but there are signs of improvement. In Assam the ratios have risen not very irregularly from 16·04 in 1881 to 34·21 in 1892; but as the Census Superintendent estimates the death-rate amongst the large number of newly-arrived immigrants at more than 40 per 1,000 per annum, it seems that the increase is to some extent due to these people. In Lower Burma the ratios for deaths, like those for births, are the worst in all India; and they do not show much improvement.

11. On the whole, after making allowances for the different considerations set out in the preceding paragraphs, the Government of India consider that the figures in the statements appended to this Resolution show that there has been since 1881 a gradual, if slight, improvement in the registration of both births and deaths throughout the areas in which they are registered. The Governor-General in Council is, however, of opinion that a much greater improvement is to be expected, especially in the larger provinces of Madras, Bombay and Bengal, and in Burma. The success which has been attained in some parts of India, compared with the failure in others, shows that the problem of accurate registration is not insoluble when sustained attention is devoted to it. His Excellency in Council accordingly, in view of the great importance of the subject, desires each Local Government

to consider carefully its existing machinery for the collection and collation of these statistics, and to report what improvements are possible, and how it is proposed to give effect to them. The Government of India fully appreciate the difficulties which surround the subject, but they trust that Local Governments will recognise, in consideration of the improvements which have taken place, especially in some provinces, that the time has come to endeavour to remove, as far as possible, the former untrustworthiness of these returns which, when fairly accurate, will be of the greatest value to all concerned in the administration of the country.

(True extract.)
C. J. LYALL,
Secretary to the Government of India.

STATEMENT I.

Provinces in British India.	Total Population according to the Census of 1881.	Total Population according to the Census of 1891.	Actual Increase of Population in 1891 since 1881 according to the Census.	Increase per 1,000 in Population in 1891 since 1881 according to the Census.	Total Number of Births registered during the Years 1881-90.	Total Number of Deaths registered during the Years 1881-90.	Actual Increase obtained by deducting Deaths registered from Births registered during 1881-90.	Increase per 1,000 on Census Population in 1891 since 1881, according to Results of Births and Deaths registered during 1881-90.	Difference between Columns 5 and 9.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Madras	30,827,113	35,630,440	4,803,327	155·82	8,234,165	5,811,385	2,431,780	78·88	76·94
Bombay (excluding Aden)	16,471,107	18,857,044	2,385,937	144·86	5,646,001	4,313,729	1,332,272	80·89	63·97
Bengal	66,750,520	71,346,987	4,596,467	68·86	436,259	14,467,655	—14,031,396	— 210·21	— 279·06
North-Western Provinces and Oudh.	44,107,869	46,905,085	2,797,216	63·42	17,423,357	14,462,639	2,960,718	67·12	— 3·7
Punjab	18,843,186	20,866,847	2,023,661	107·39	7,338,003	5,857,545	1,480,458	78·56	28·83
Central Provinces	9,838,791	10,784,294	945,503	96·1	3,594,973	2,859,900	734,973	74·70	21·40
Lower Burma	3,736,771	4,658,627	921,856	246·7	825,641	640,104	185,537	49·65	197·05
Assam	4,881,426	5,476,833	595,407	121·97	1,133,584	1,120,007	13,577	2·78	119·19
Hyderabad Assigned Districts	2,672,673	2,897,491	224,818	84·12	1,070,798	928,106	142,692	53·39	30·73
Total (excluding Bengal)*	131,378,936	146,076,661	14,697,725	111·87	45,275,422	35,993,415	9,282,007	70·65	41·22

* As births were not registered outside towns during the decade.

STATEMENT II. (a).

(*Provincial Birth-rates*, 1881 *to* 1892.
(Calculated upon the population of the areas under registration.)

Provinces in British India.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.
Madras	25·52	26·00	27·18	28·78	28·70	29·85	30·44	29·92	30·93	31·33	27·44 *32·43*	25·08 *29·64*
Bombay	27·94	29·86	30·50	32·50	34·79	35·34	38·18	38·57	36·49	38·96	36·27 *41·49*	34·57 *39·54*
Bengal*	25·52	22·49	22·08	23·52	24·71	21·04	19·36	20·63	22·77	21·54	21·47 *23·42*	28·16 *28·15*
North-Western Provinces and Oudh.	40·34	37·55	40·84	43·78	41·25	37·62	38·74	38·26	36·94	39·70	33·26 *35·37*	36·17 *38·46*
Punjab†	37·25	36·97	39·35	43·37	39·19	39·82	39·23	37·65	40·64	39·43	34·02 *37·41*	38·16 *41·63*
Central Provinces	41·21	41·73	40·59	41·75	45·36	37·79	40·21	41·52	39·30	38·41	39·99 *43·09*	38·39 *41·37*
Lower Burma	19·98‡	22·07	22·92	22·66	25·51	22·57	21·74	23·91	21·16	23·20	21·13 *26·09*	24·83 *30·67*
Assam	19·20§	26·35§	23·91	26·61	27·96	27·55	28·60	31·62	31·20	30·56	28·59 *31·70*	31·05 *34·44*
Hyderabad Assigned Districts	39·89	42·00	40·27	41·34	42·88	37·35	40·51	41·36	39·60	42·53	42·87 *44·09*	40·01 *41·34*

* Births registered only in certain municipal towns.
† Excluding the population of Military Cantonments.
‡ Excluding two districts (Aracan and Salween Hill tracts).
§ Excluding Sylhet and Cachar.

N.B.—The figures in *italics* in the columns for 1891 and 1892 are the ratios calculated, as are the ratios for the other years shown, on the population in 1881.

STATEMENT II. (*b.*)

Provincial Death-rates from 1881 *to* 1892.

(Calculated upon the Population of the Areas under Registration.)

Provinces in British India.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.
Madras	16·24	16·29	19·01	23·10	21·89	19·75	21·67	21·43	23·57	22·80	22·19 *26·22*	22·28 *26·33*
Bombay	23·18	20·87	25·54	24·82	28·78	23·17	27·67	28·44	31·52	28·18	27·26 *31·18*	32·50 *37·18*
Bengal	20·97	20·42	18·83	20·84	22·74	22·00	23·46	22·95	24·26	24·48	26·95 *28·79*	31·93 *34·12*
North-Western Provinces and Oudh.	31·80	33·67	27·58	35·26	31·98	33·27	35·86	30·09	31·11	37·27	31·14 *33·12*	34·11 *36·28*
Punjab	27·83	27·03	25·47	35·36	27·15	26·84	34·61	30·16	31·90	47·29	29·13 *31·76*	49·48 *53·98*
Central Provinces	27·43	29·98	34·56	27·30	34·22	33·24	32·70	28·76	43·80	32·52	32·98 *35·54*	34·14 *36·79*
Lower Burma	15·75	16·14	14·67	18·95	19·89	15·54	16·18	23·40	17·07	17·40	16·22 *20·03*	20·00 *24·70*
Assam	16·04	25·85	27·15	29·37	27·91	27·77	24·52	27·98	30·70	29·64	29·91 *33·17*	34·21 *37·95*
Hyderabad Assigned Districts	29·15	29·36	51·36	24·64	34·05	36·71	45·33	24·75	42·57	35·50	40·68 *44·10*	28·91 *31·34*

N.B.—The figures in *italics* in the columns for 1891 and 1892 are the ratios calculated, as are the ratios for the other years shown, on the population in 1881.

00134527

Digitized with financial assistance from

Government of Maharashtra

on 01 February, 2020